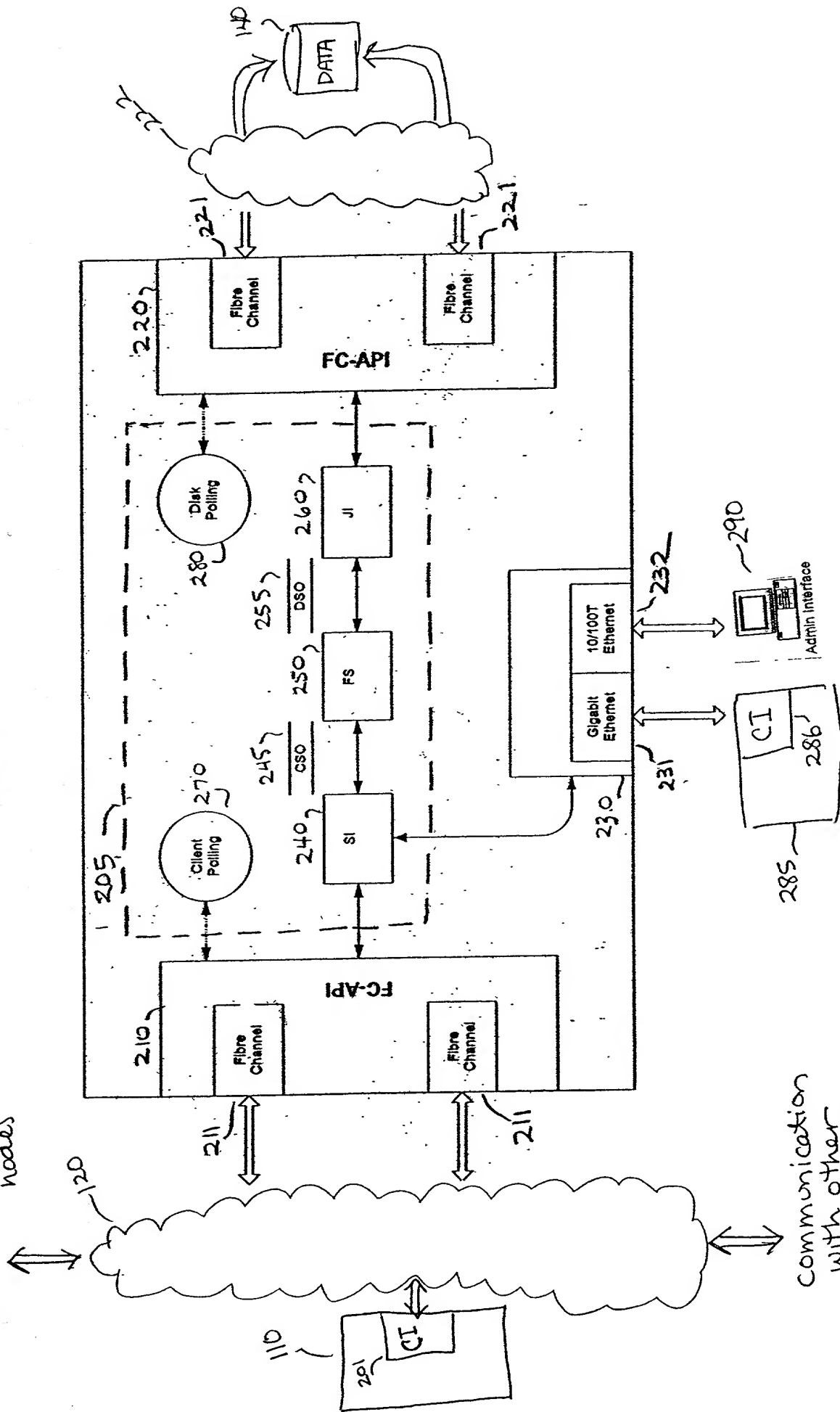


FIGURE 1 - General Overview of Distributed File Storage System

communication  
with other server  
nodes

20061002609001



communication  
with other  
server nodes

FIGURE 2 : One Embodiment of a Server Node

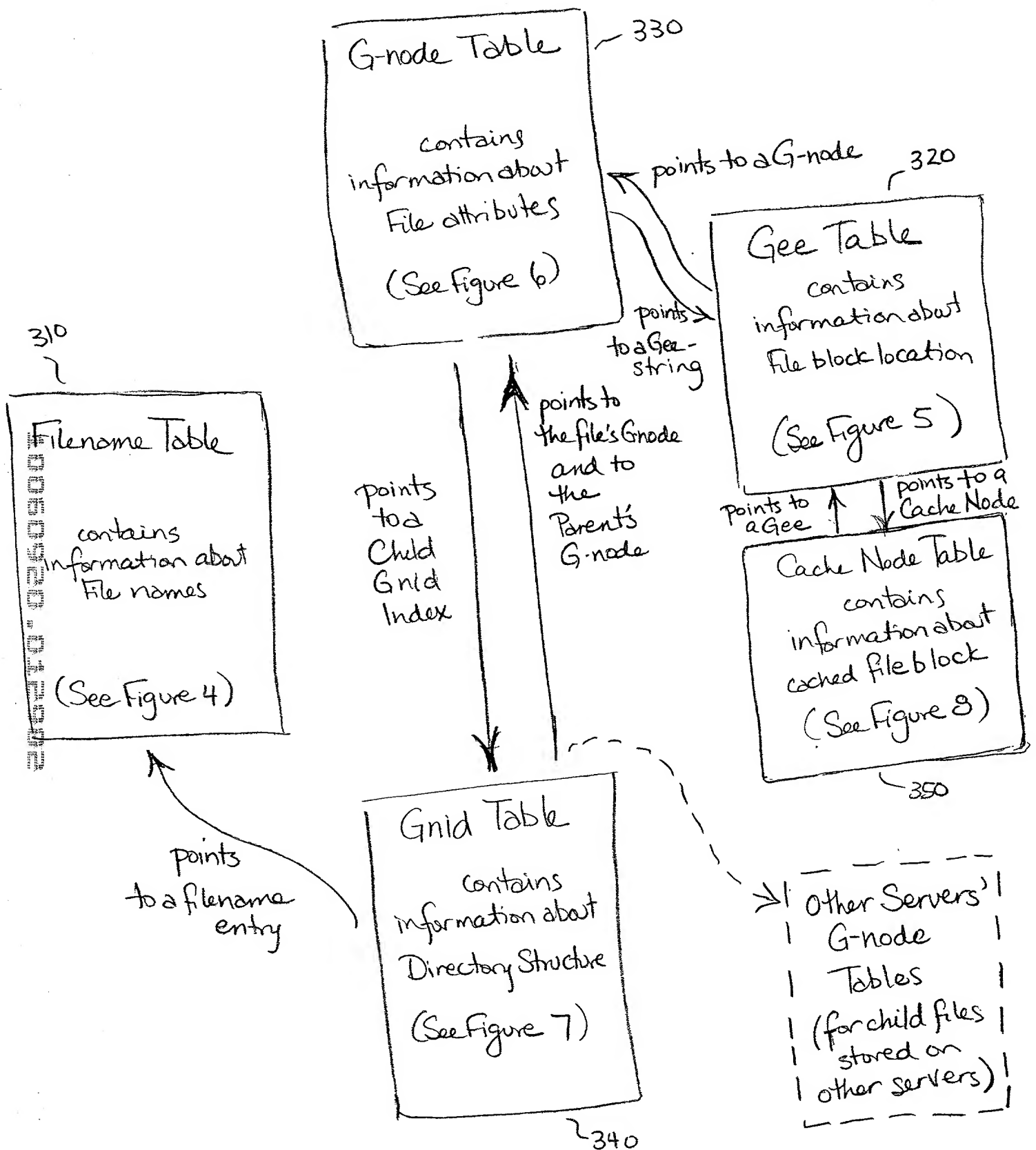


FIGURE 3 - Five metadata structures

310

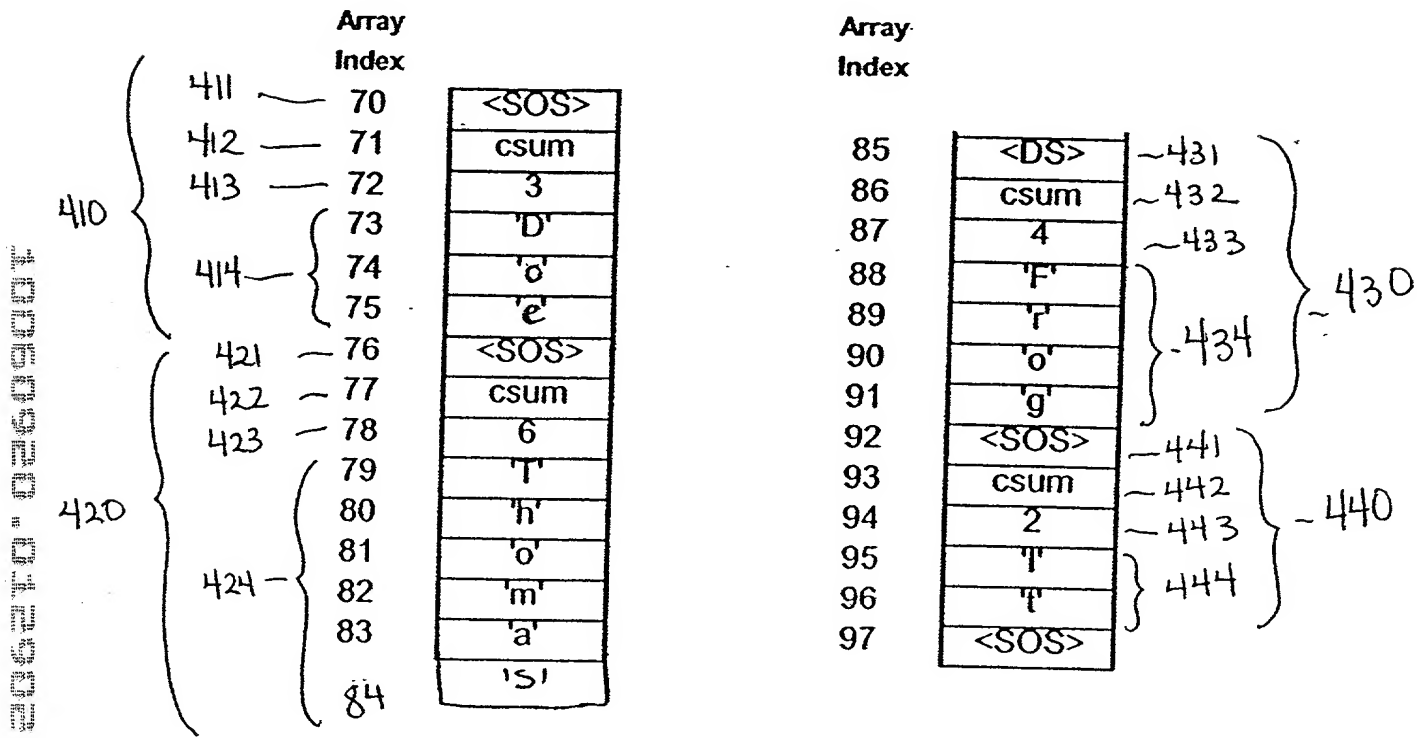


FIGURE 4 - Sample Portion of a Filename Table

320

590

591

592

	Index	G-Code	Data	File Logical Block	
510-	45	GNODE	Gnode = 67, Extent = 2, Root = TRUE		550
511-	46	DATA	Disk Logical Blocks: 456, 457 Drive 13	1	
512-	47	DATA	Disk Logical Blocks: 667, 668 Drive 15	2	
513-	48	DATA	Disk Logical Blocks: 112, 113 Drive 19	3	
514-	49	PARITY	Disk Logical Blocks: 554, 555 Drive 2		
515-	50	DATA	Disk Logical Blocks: 458, 459 Drive 13	4	
516-	51	DATA	Disk Logical Blocks: 669, 670 Drive 15	5	
517-	52	DATA	Disk Logical Blocks: 119, 120 Drive 19	6	
518-	53	PARITY	Disk Logical Blocks: 556, 557 Drive 2		
519-	54	LINK	Index 76		
	...	...	...		551
520-	76	GNODE	Gnode = 67, Extent = 3, Root = FALSE		
521-	77	DATA	Disk Logical Blocks: 460, 461, 462 Drive 13	7	
522-	78	DATA	Disk Logical Blocks: 671, 672, 673 Drive 15	8	
523-	79	PARITY	Disk Logical Blocks: 121, 122, 123 Drive 19		
524-	80	LINK	Index 88		552
	...	...	...		
525-	88	GNODE	Gnode = 67, Extent = 3, Root = FALSE		
526-	89	DATA	Disk Logical Blocks: 463, 464, 465 Drive 13	9	
527-	90	DATA	Disk Logical Blocks: 674, 675, 676 Drive 15	10	
528-	91	PARITY	Disk Logical Blocks: 124, 125, 126 Drive 19		
529-	92	GNODE	Gnode = 43, Extent = 4, Root = FALSE		
	...	...	...		

FIGURE 5 - Sample Portion of a Gee Table

2025-09-09 10:00:00

Attribute Data	
602	File Attribute - type
604	File Attribute - mode
606	File Attribute - links
608	File Attribute - uid
610	File Attribute - gid
612	File Attribute - size
614	File Attribute - used
620	File Attribute - fileId
622	File Attribute - atime
624	File Attribute - mtime
626	File Attribute - ctime
628	Child Gnid Index
630	Gee Index - Last Used
631	Gee Offset - Last Used
632	Gee Index - Midpoint
633	Gee Offset - Midpoint
634	Gee Index - Tail
635	Gee Offset - Tail
636	Gee Index - Root
638	Gnode Status
640	Quick Shot Status
642	Quick Shot Link

600

FIGURE 6 - G-NODE ATTRIBUTES

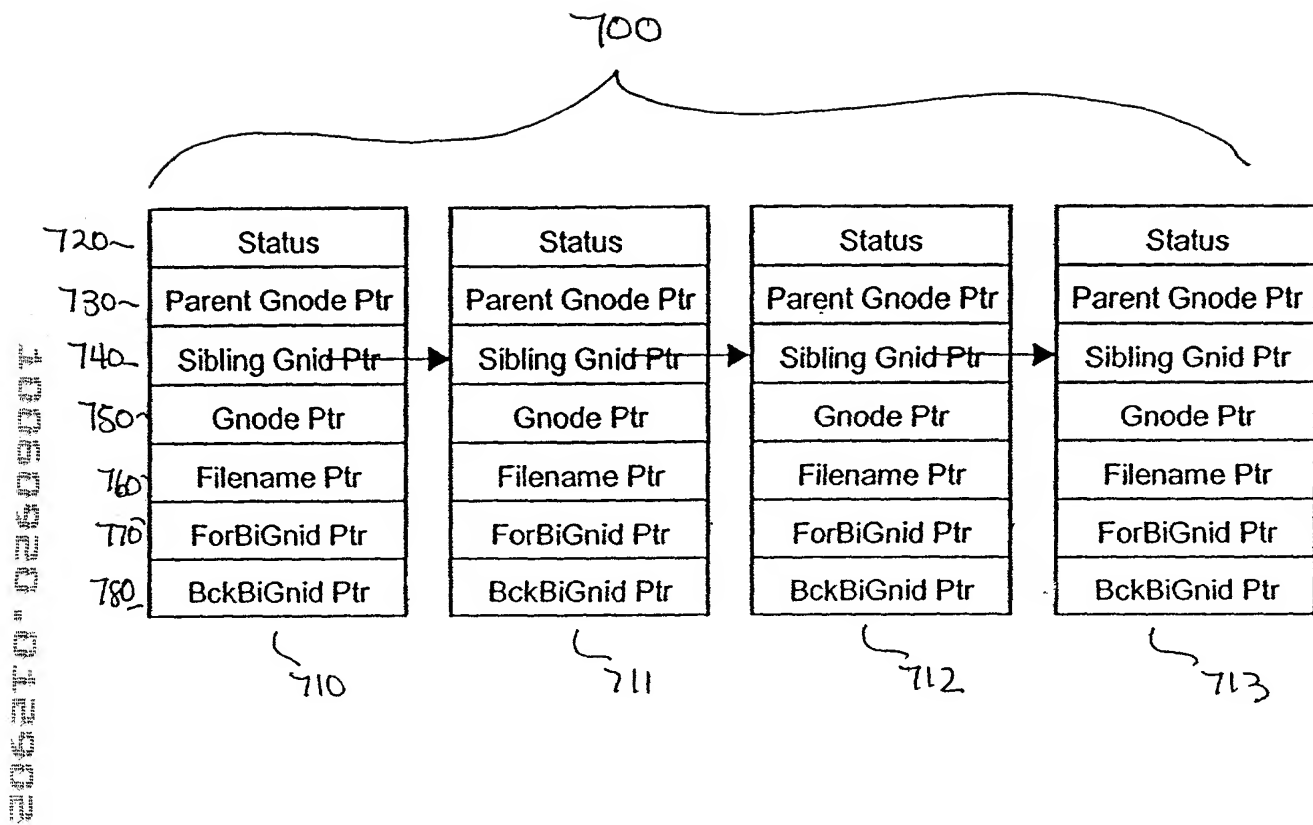


FIGURE 7- Structure of a Gnid String

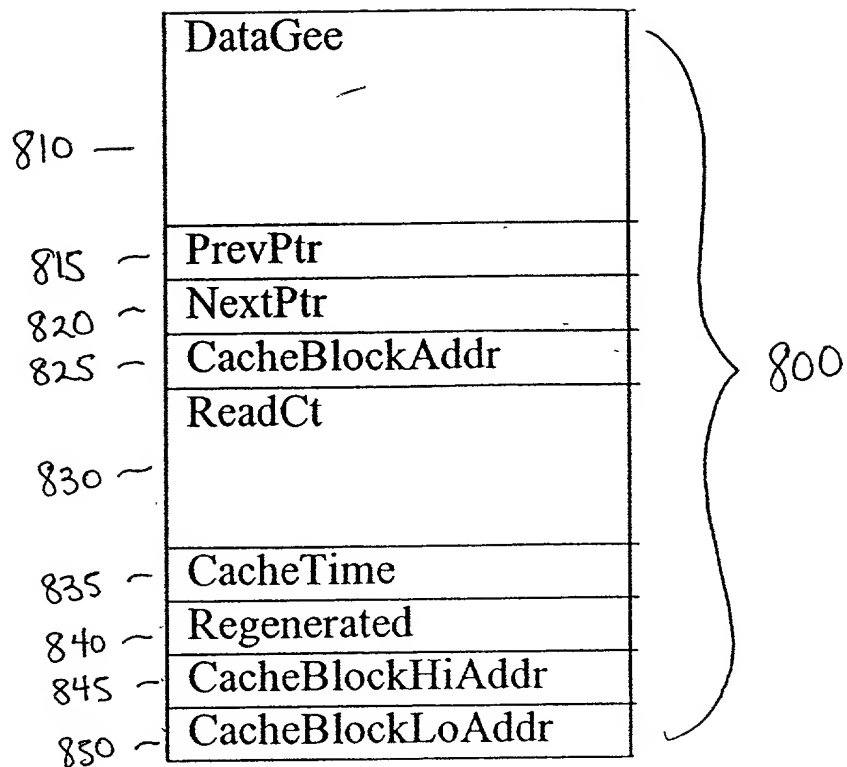


FIGURE 8a - Structure of a Cache Node



350

10060900 012002

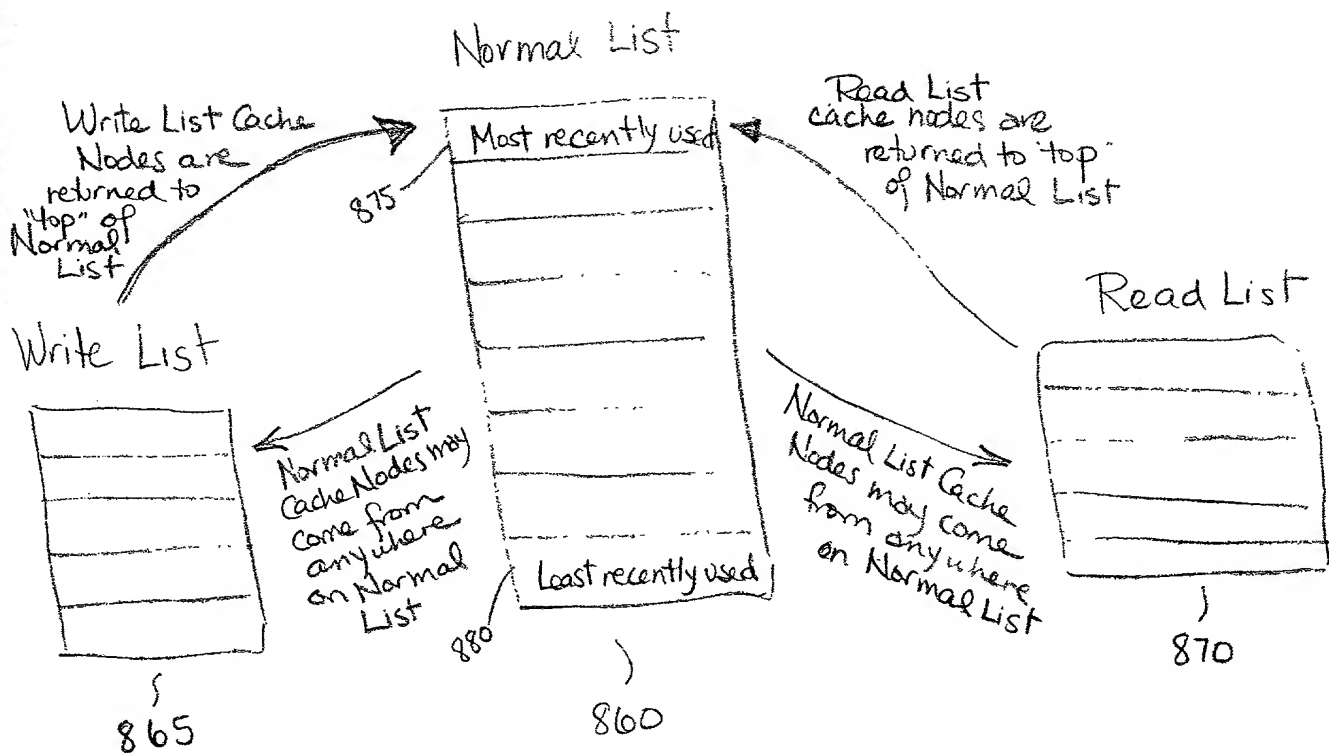


FIGURE 8B - Conceptual division of a Cache Node Table into Three Lists

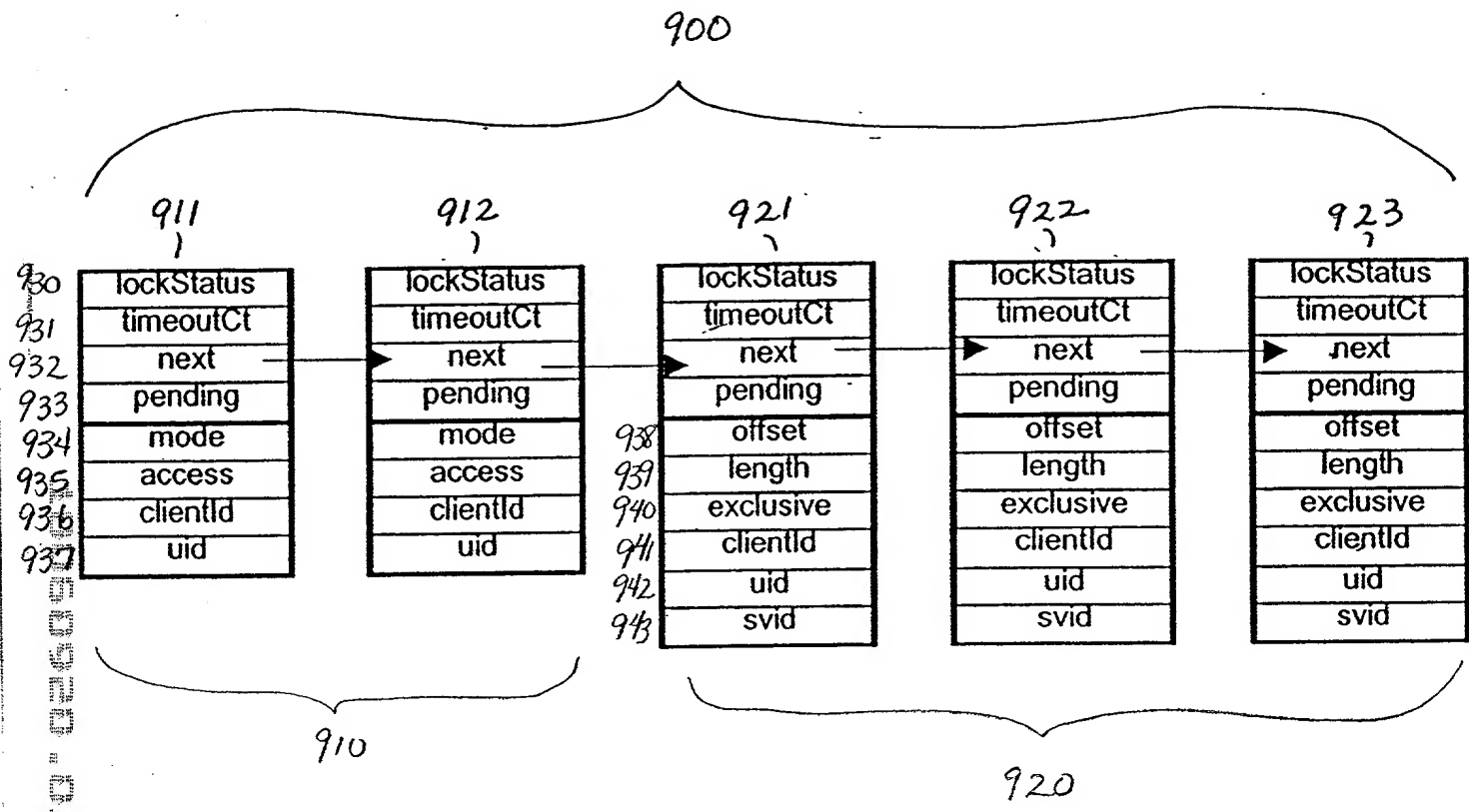


FIGURE 9 - A Sample Lock String

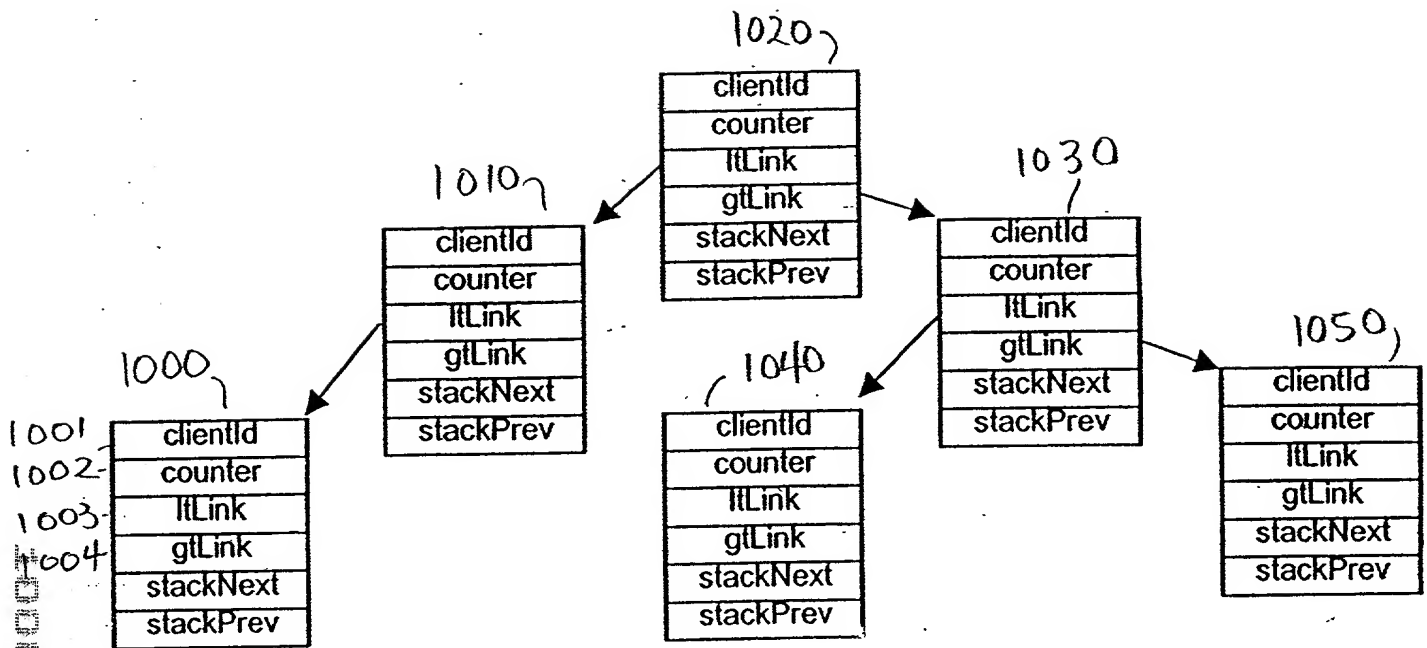


FIGURE 10 - Refresh Nodes configured as a binary tree.

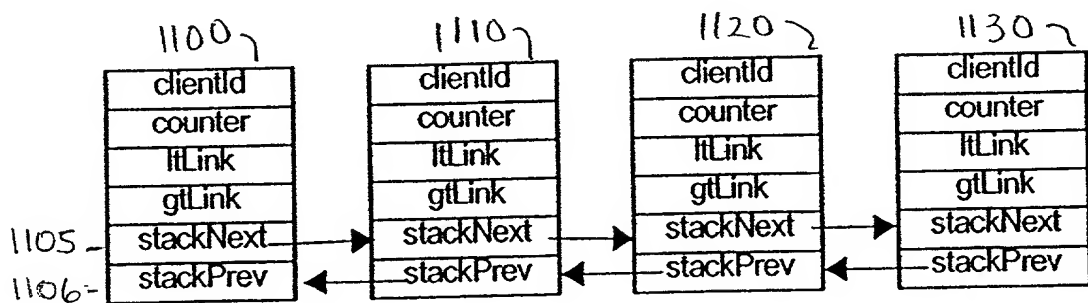


FIGURE 11 - Refresh Nodes configured as a doubly-linked list

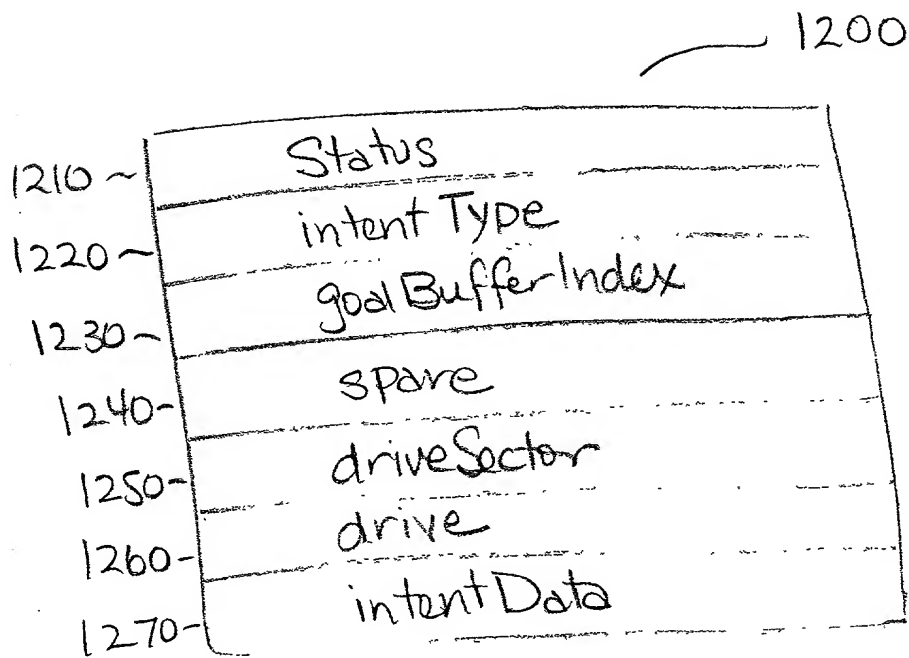


FIGURE 12 - Structure of an Intent Log Entry

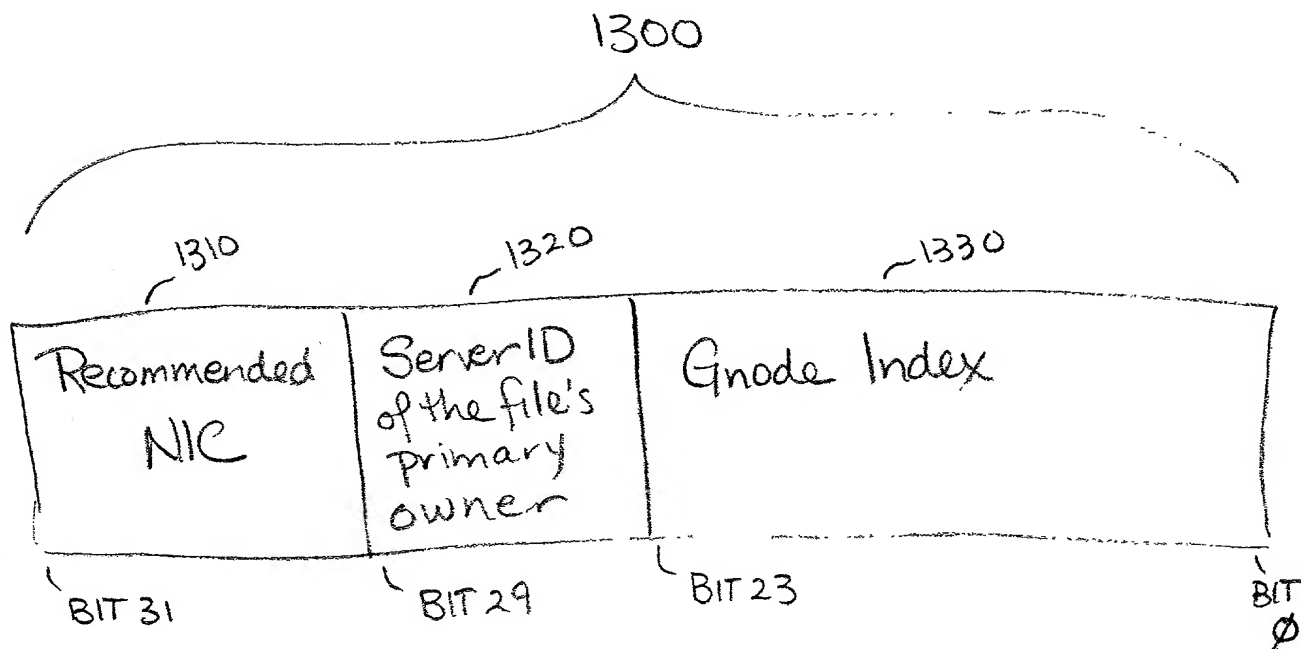


FIGURE 13 - Structure of a File Handle

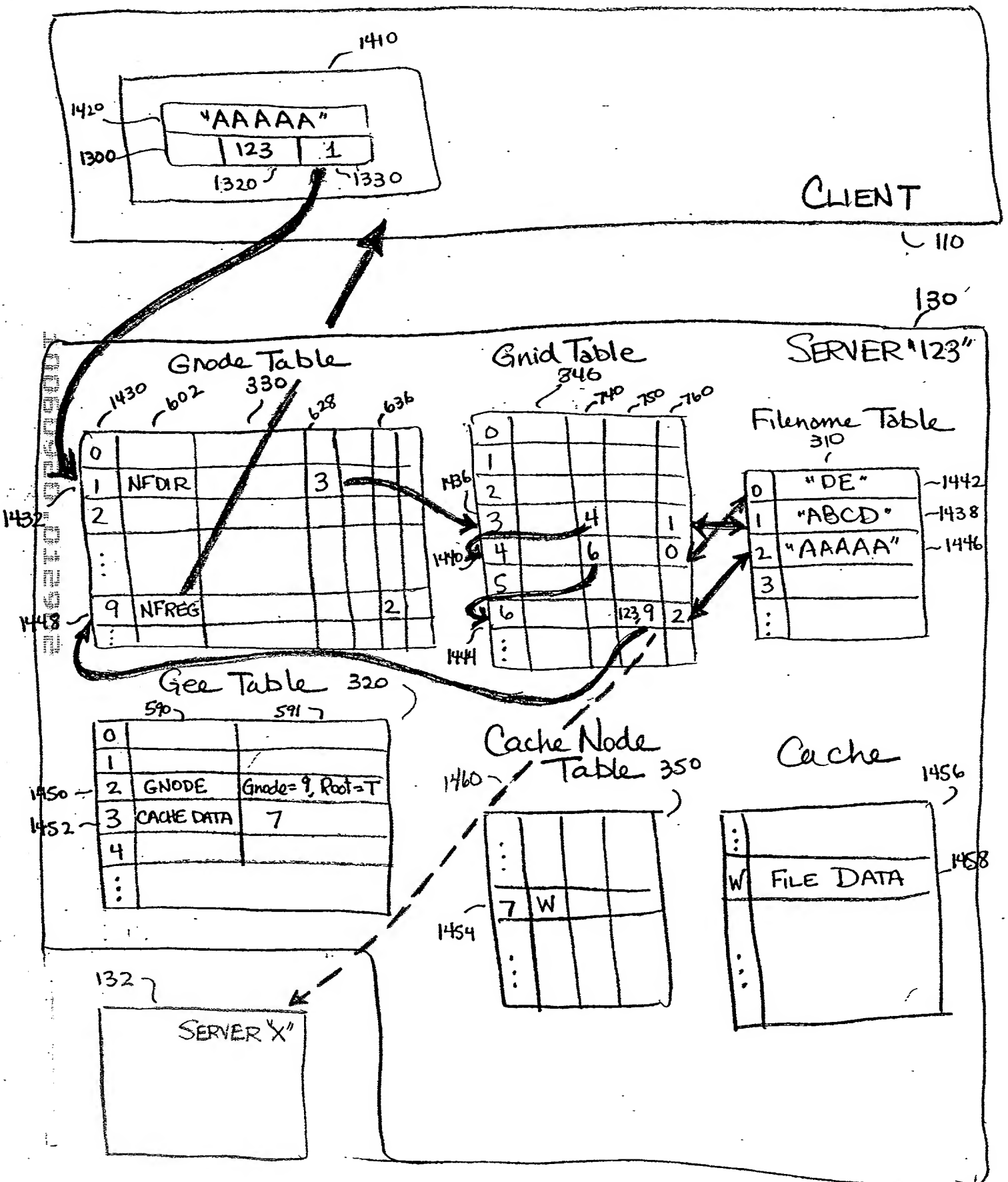


FIGURE 14a: Example of a File Look-Up

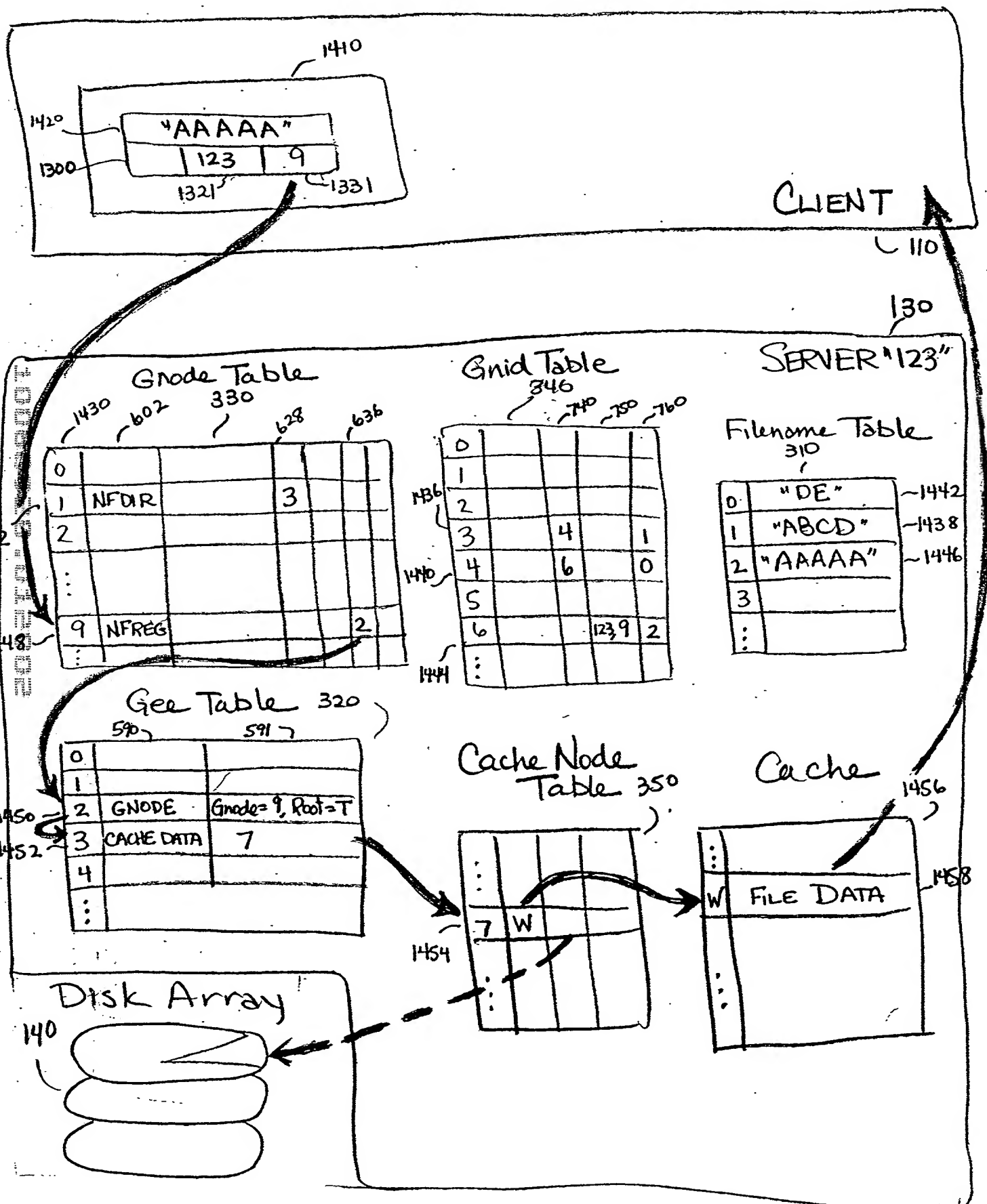


FIGURE 14b Example of a File Access

1500

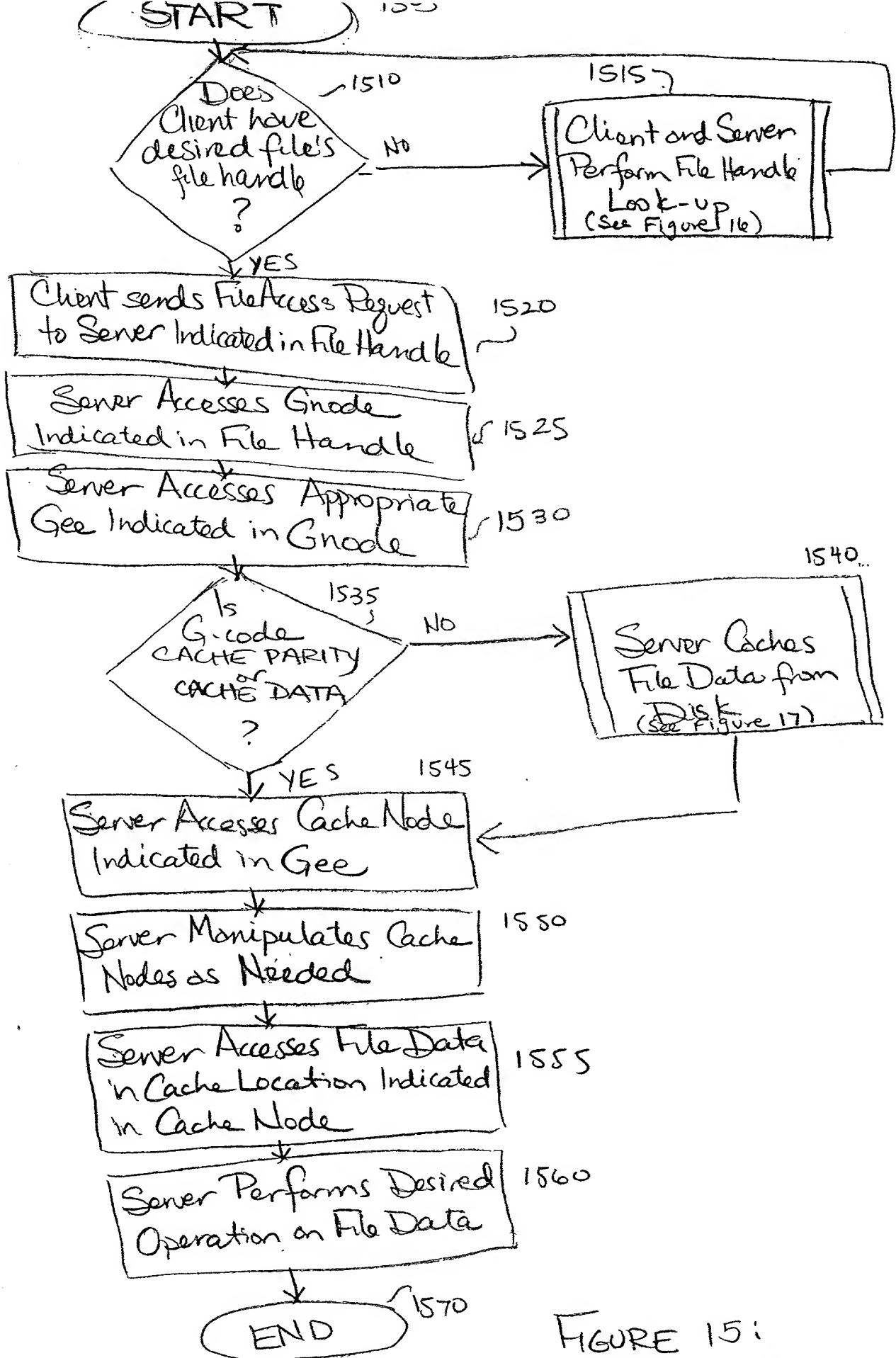


FIGURE 15:  
Performing a File Access

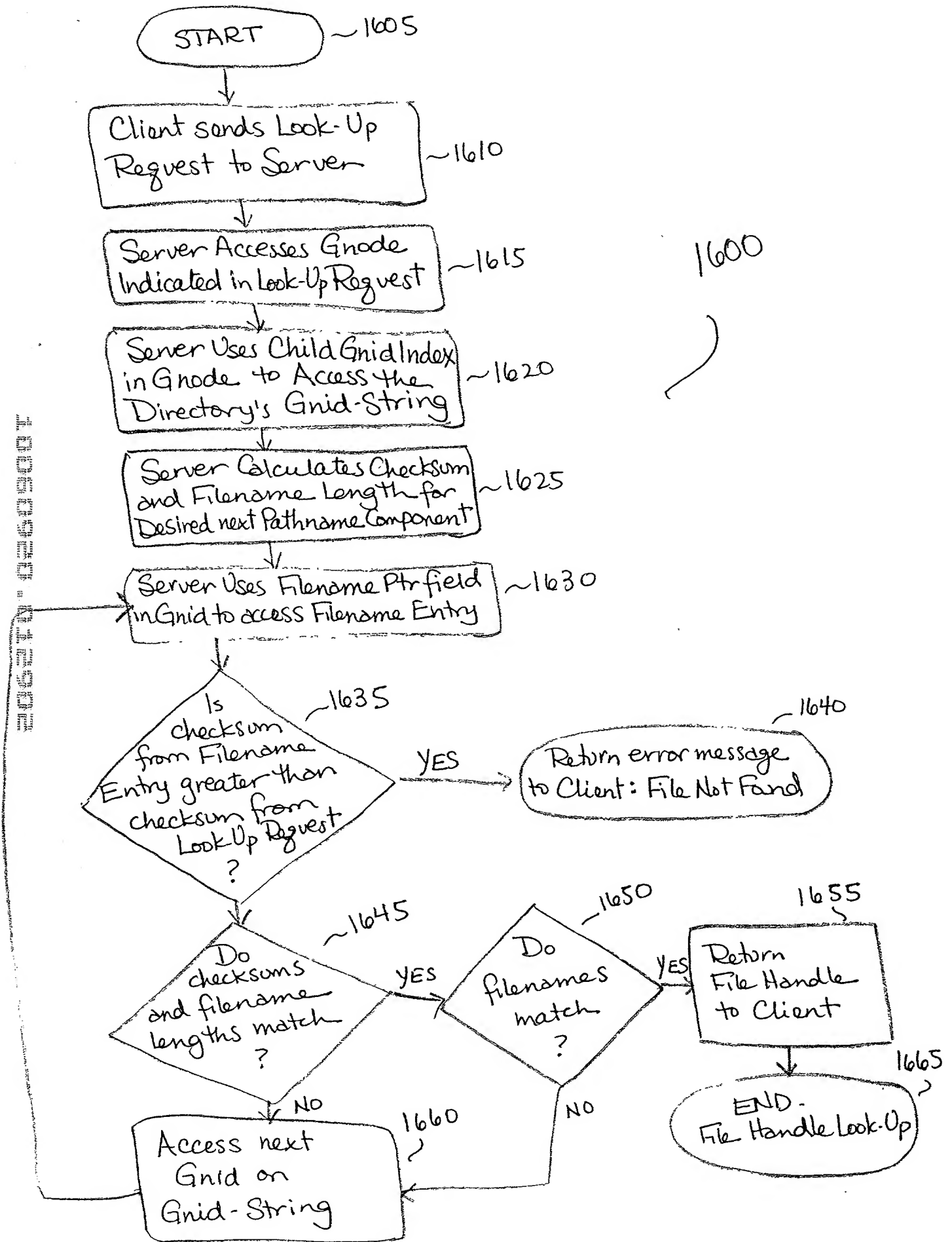


FIGURE 16: Performing a File Handle Look-Up



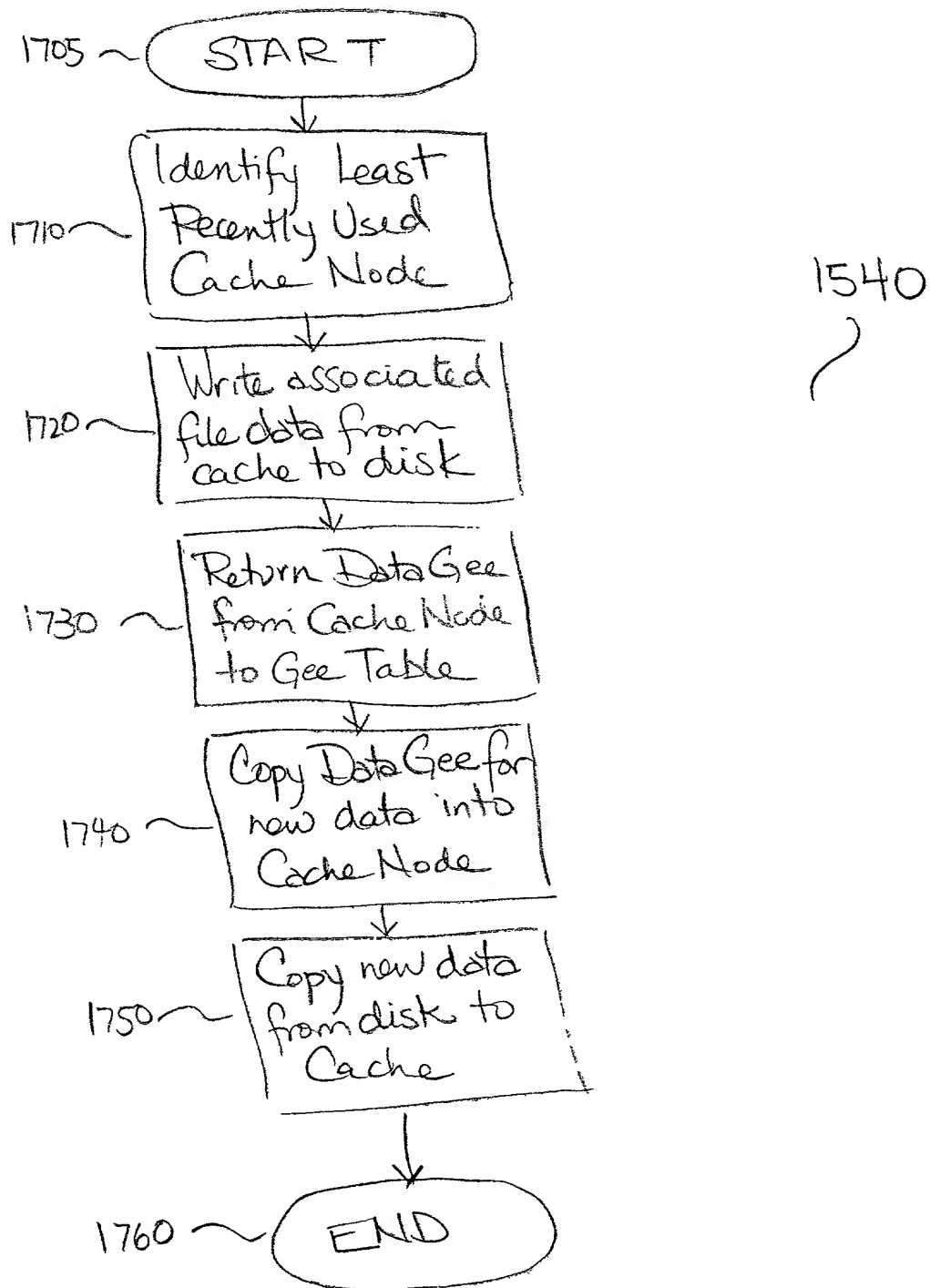


FIGURE 17: Caching File Data

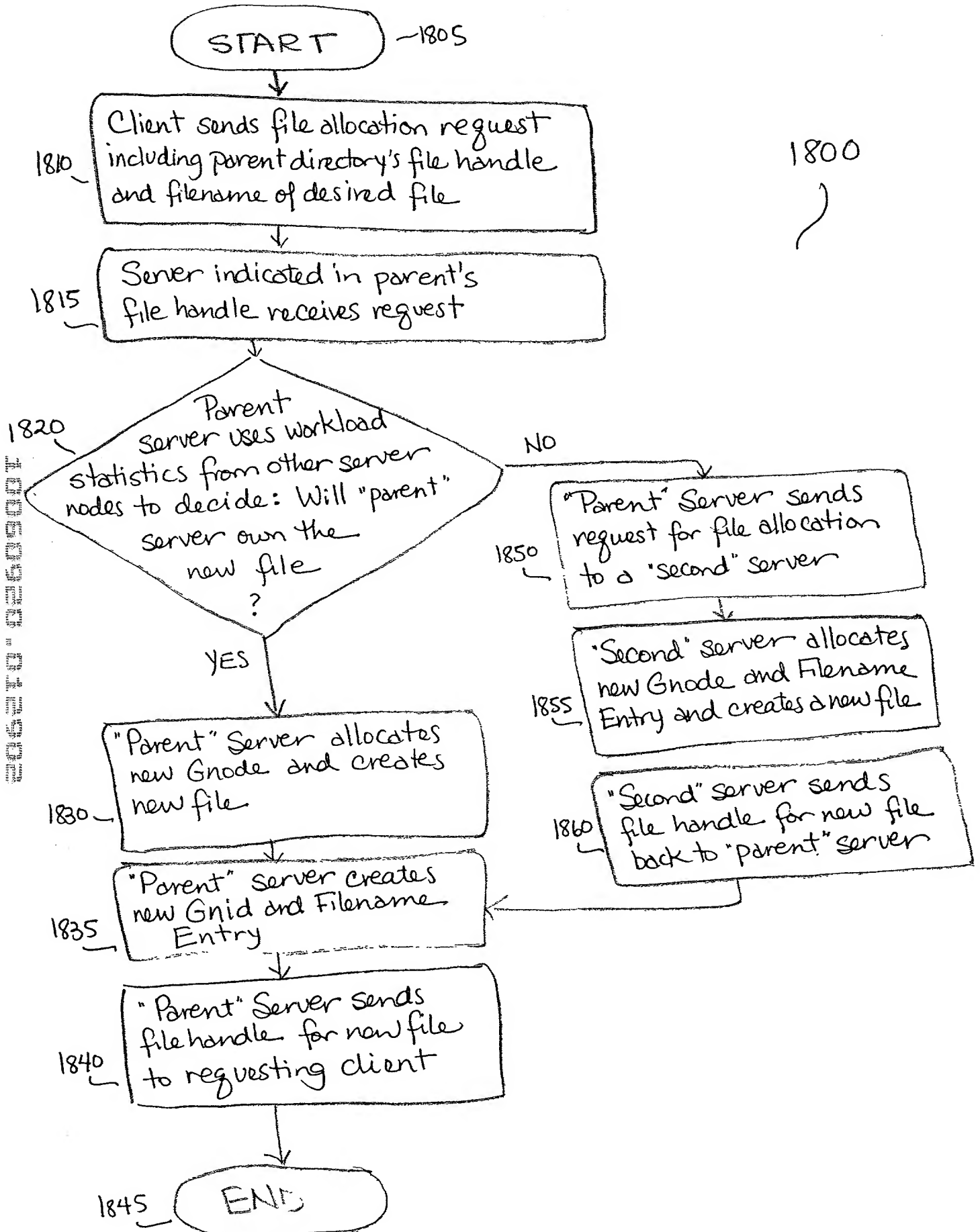


FIGURE 18 - File Allocation

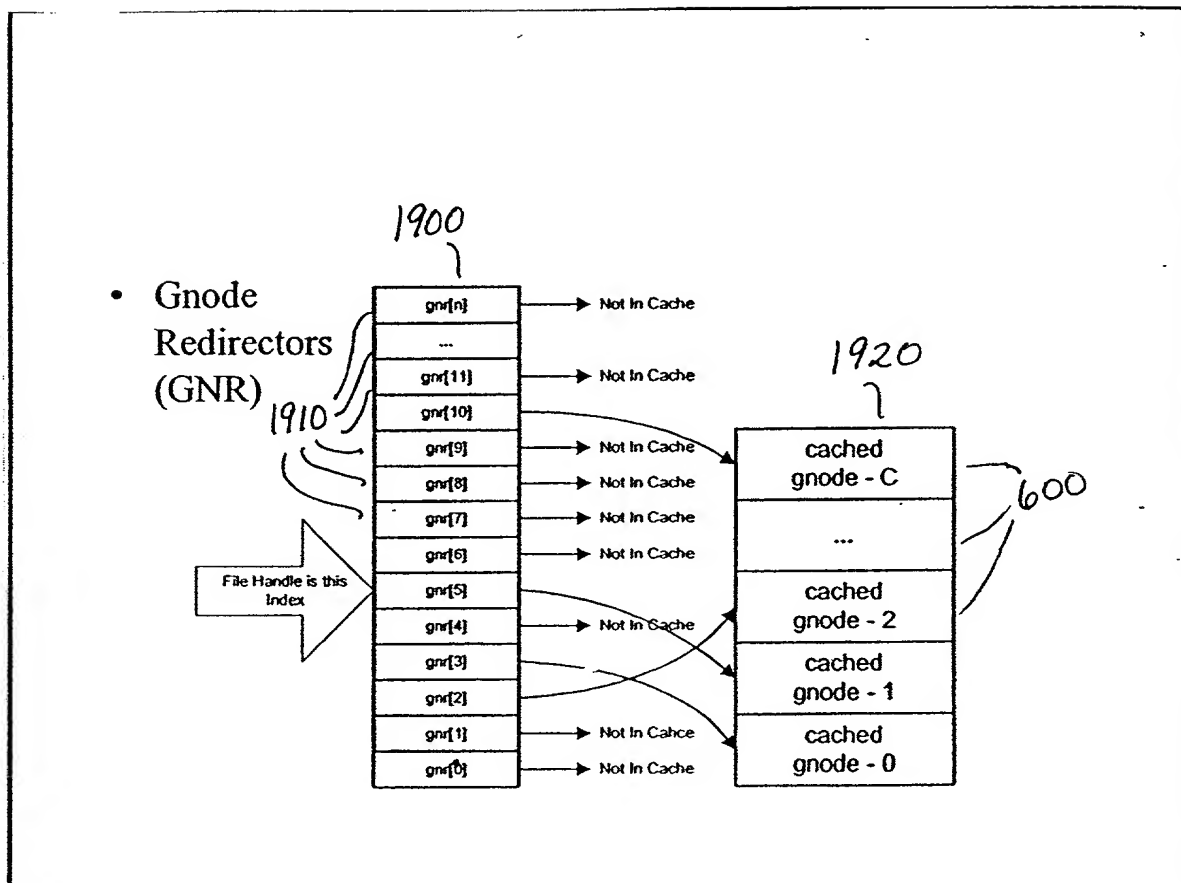


FIGURE 19

2000

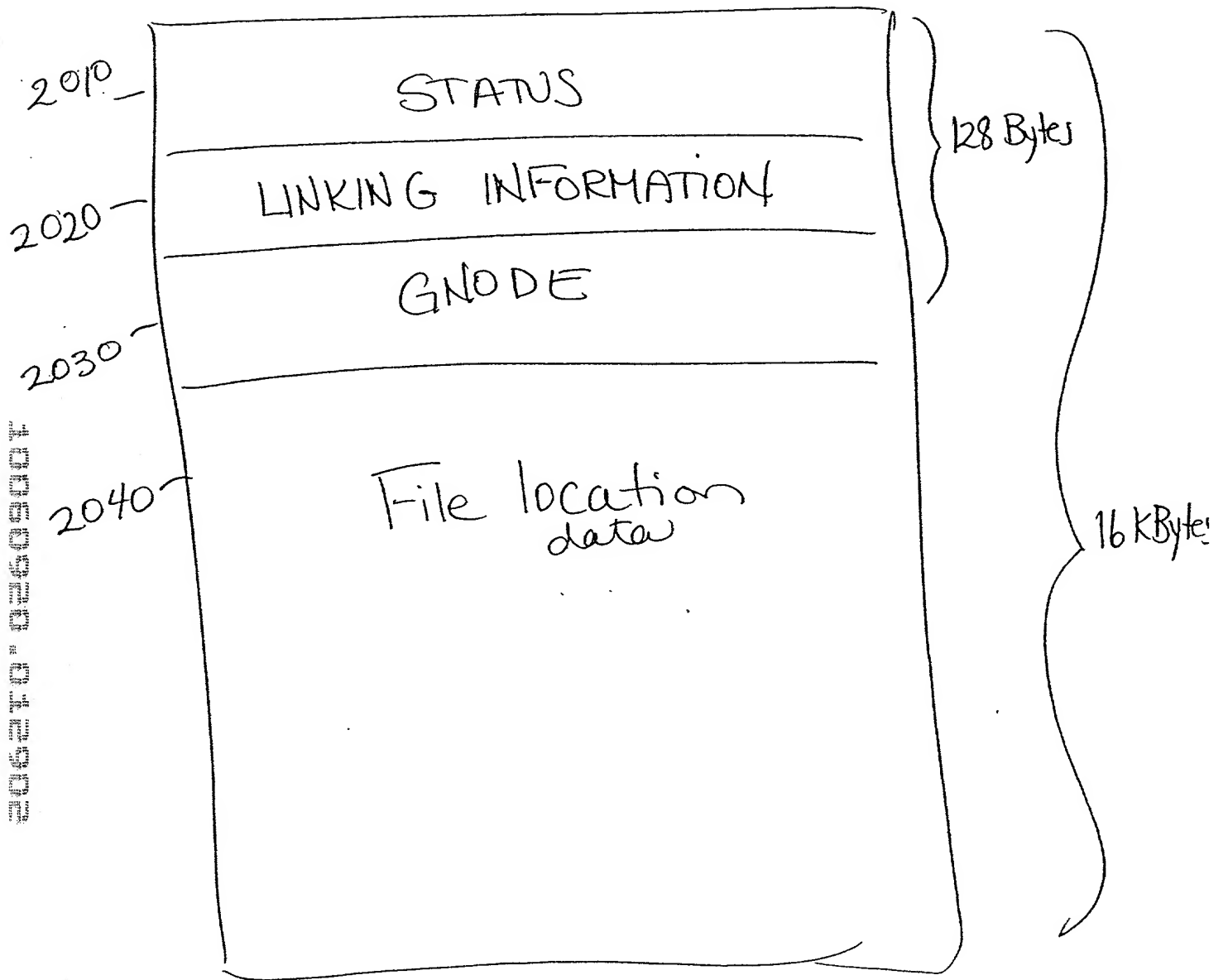


Figure 20a

FIG. 20b

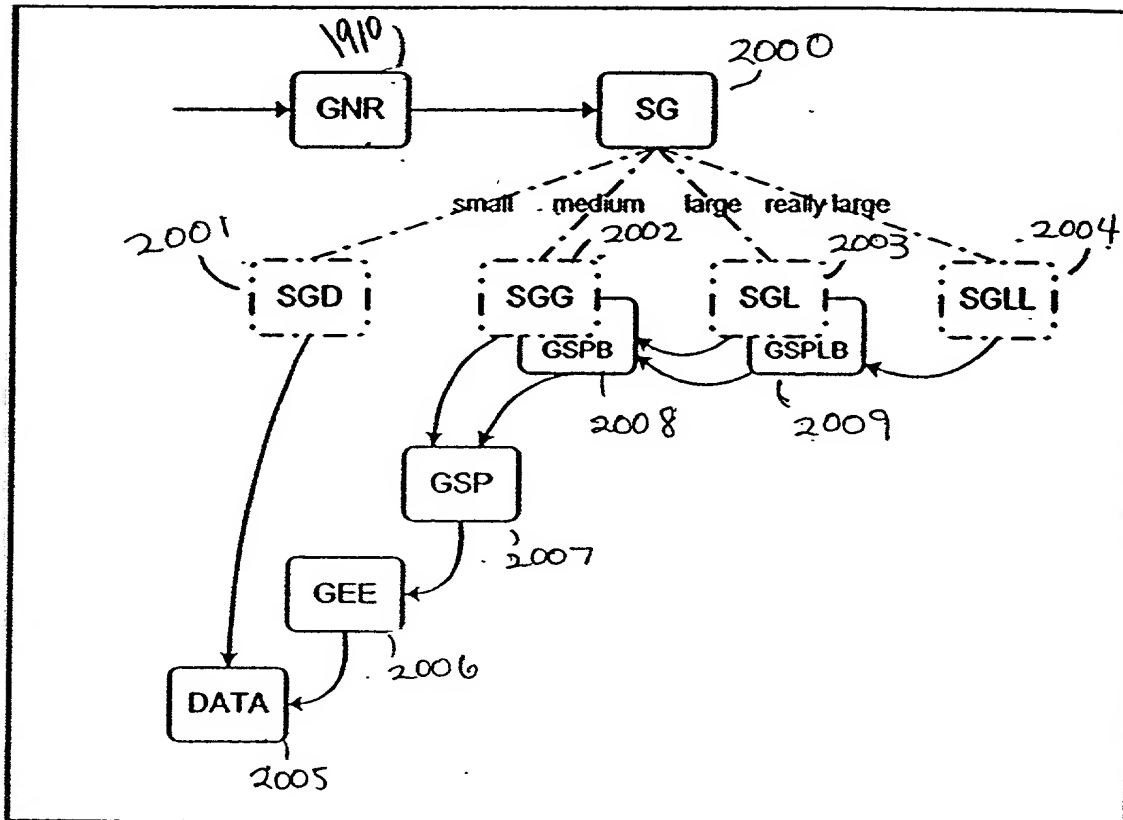


FIGURE 20b

# CONVENTIONAL RAID MAPPING (PRIOR ART)

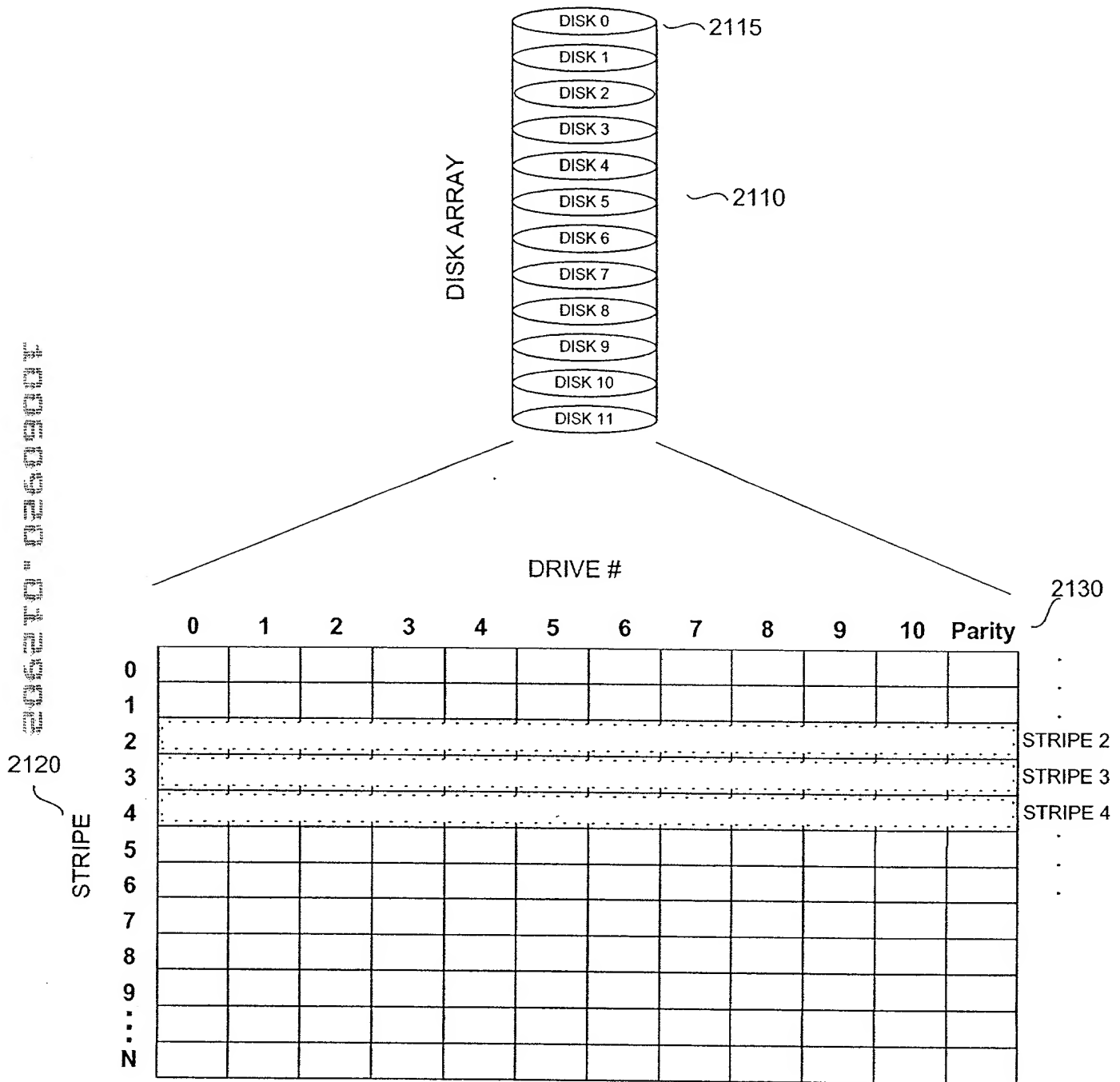


FIGURE 21

FIGURE 22A

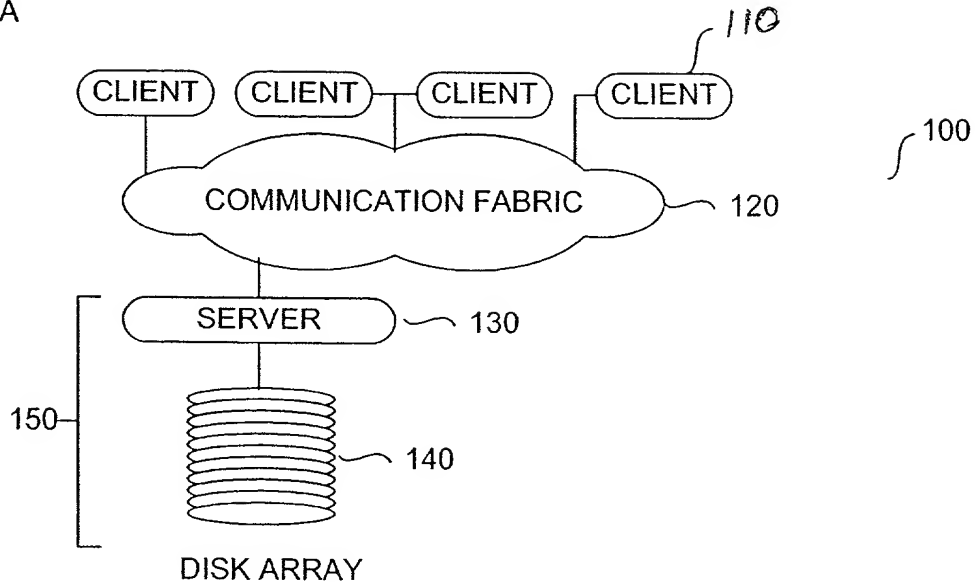
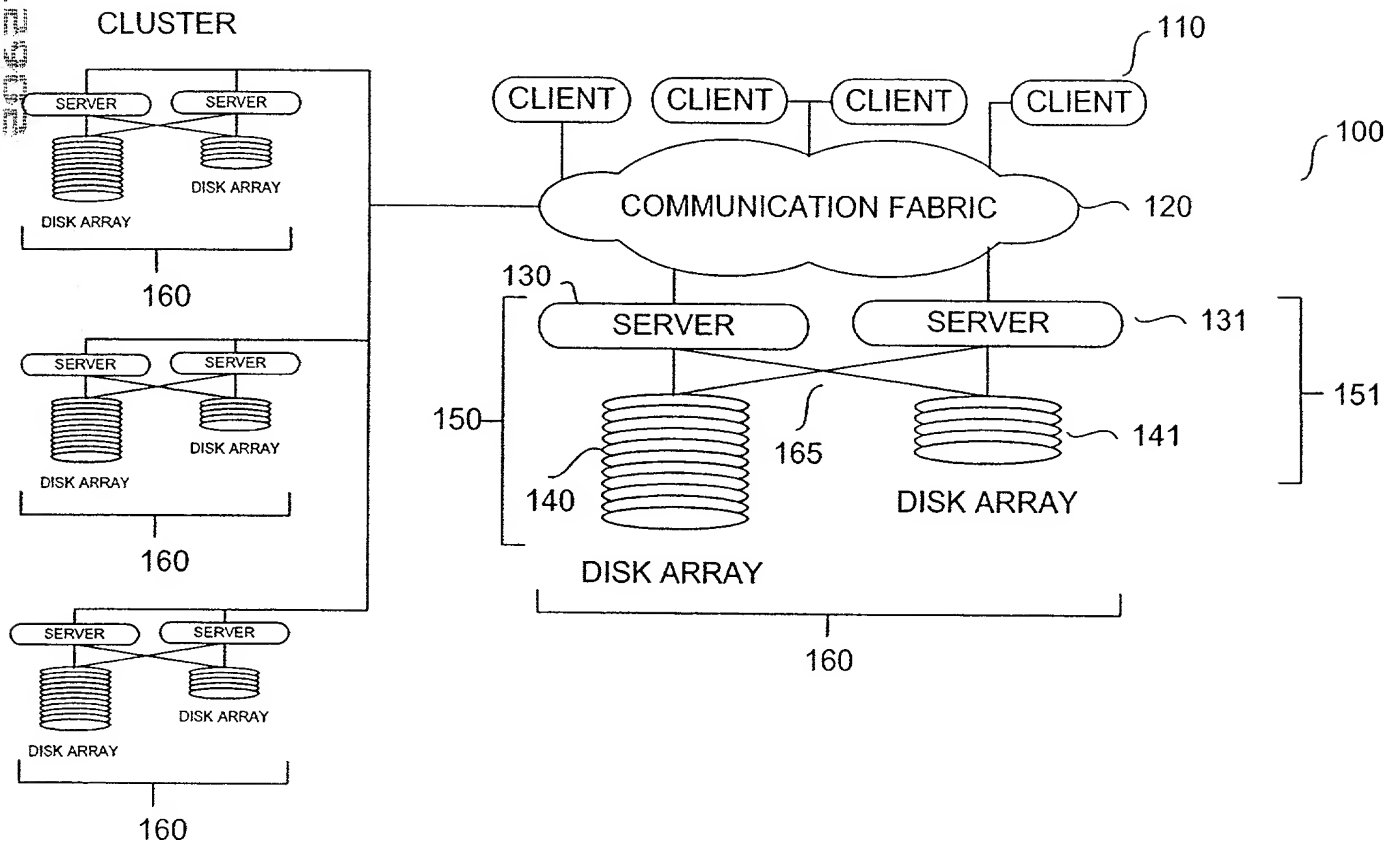


FIGURE 22B



DATE 20 10 1997

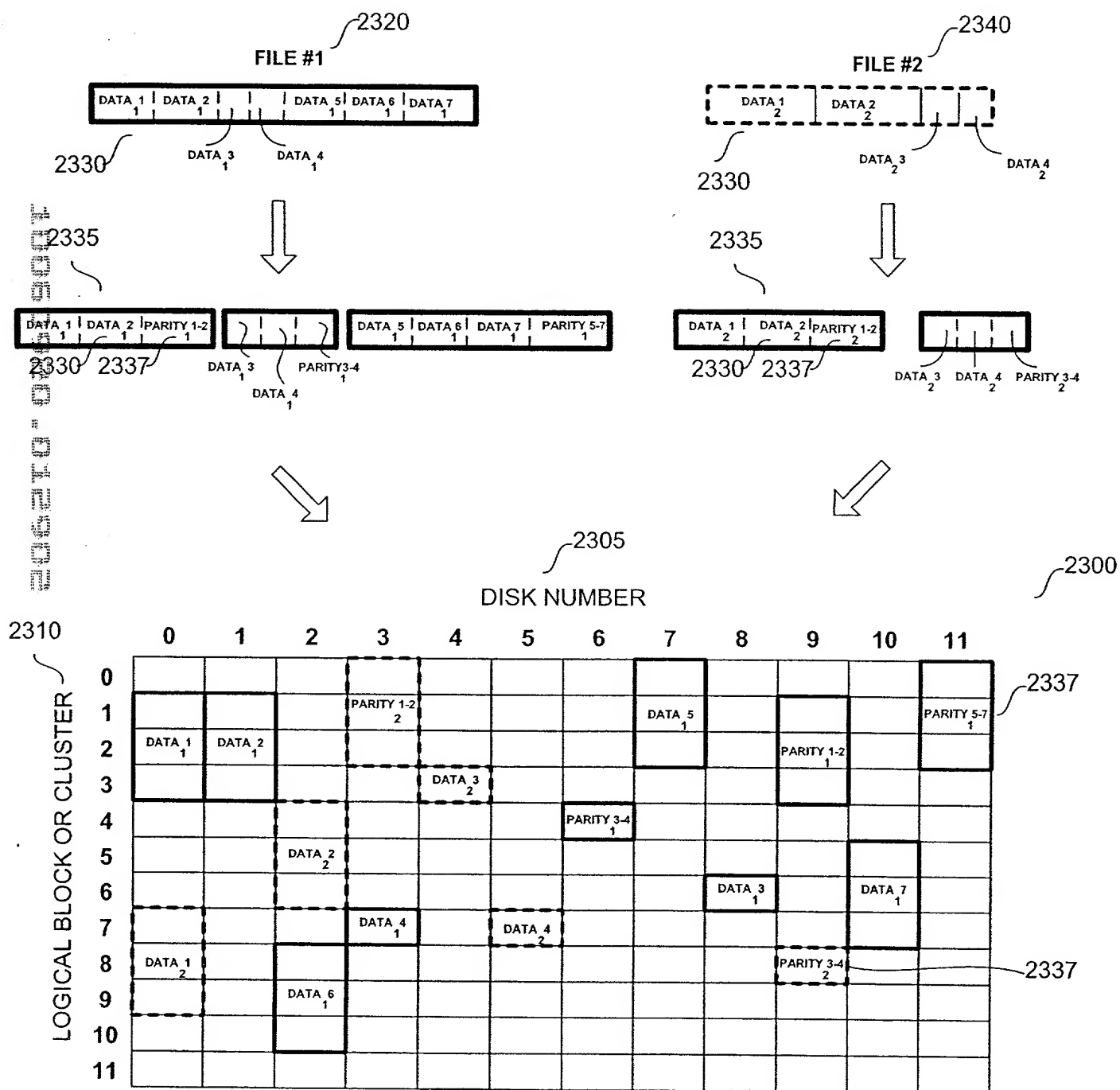




FIGURE 24A

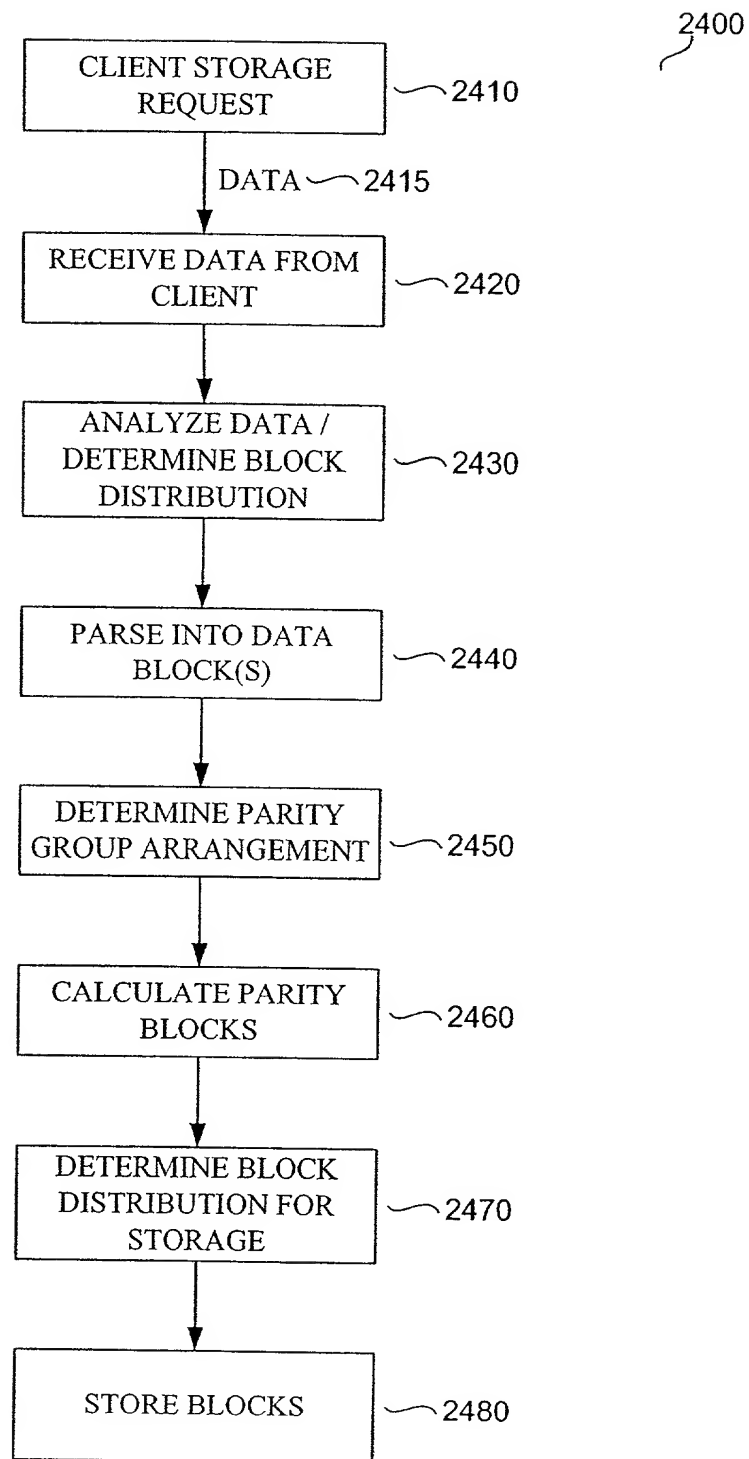


FIGURE 24B

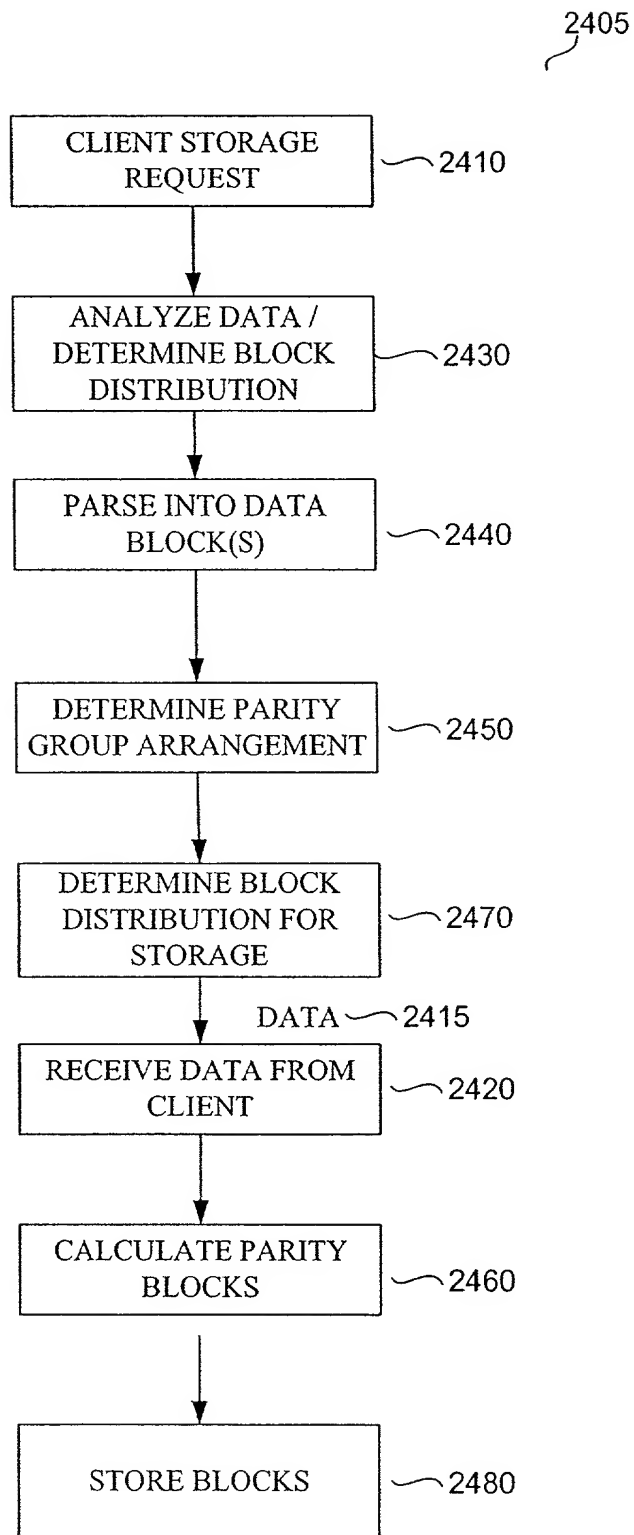


FIGURE 25

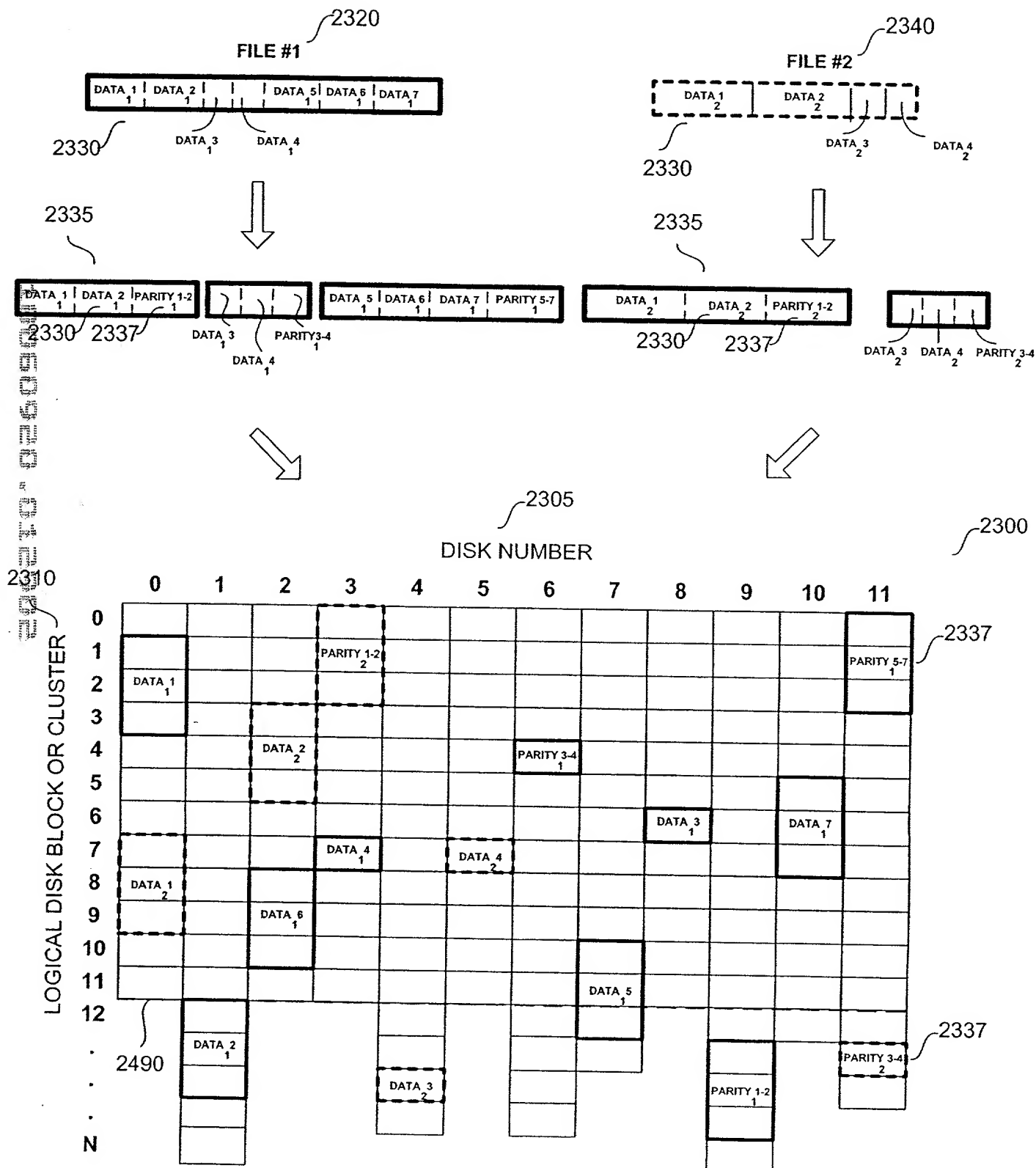


FIGURE 26A

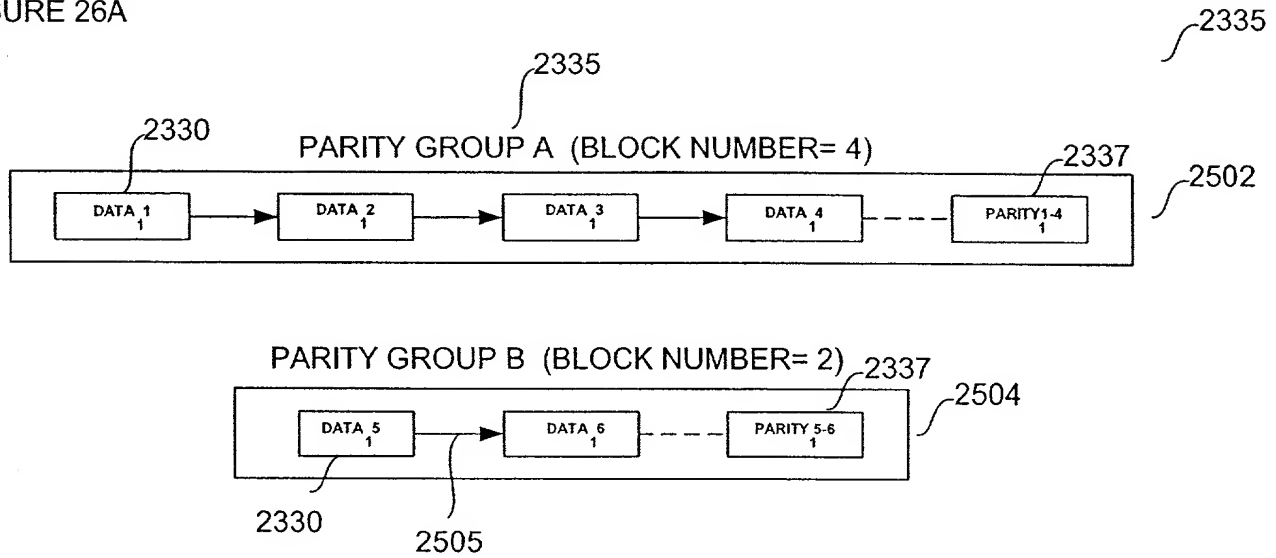
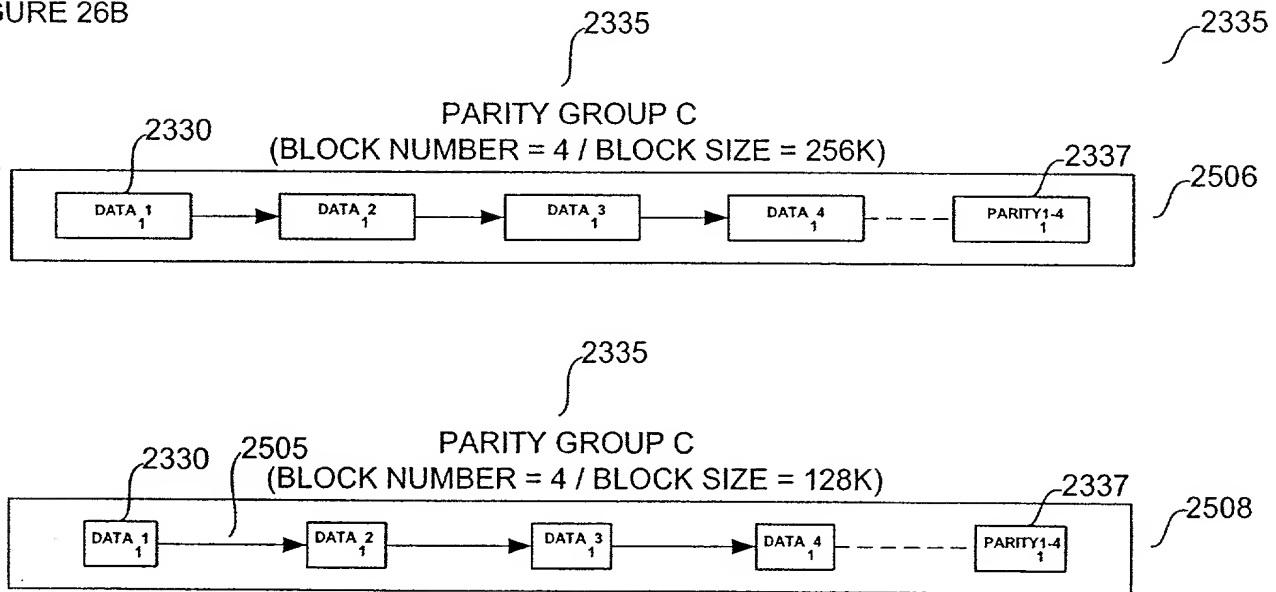


FIGURE 26B



# DISK ARRAY INITIALIZATION USING GEE TABLE SPACE ALLOCATION

2530

2532	2534	2536	
INDEX	G-CODE	DATA	2542
...	...	...	
45	GNODE	EXTENT=2	
46	DATA	BLOCKS 456, 457: Drive 13	
47	DATA	BLOCKS 667, 668: Drive 15	
48	DATA	BLOCKS 112, 113: Drive 19	
49	PARITY	BLOCKS 554, 555: Drive 2	
...	...	...	
76	GNODE	EXTENT=3	
77	DATA	BLOCKS 460, 461, 462: Drive 13	
78	DATA	BLOCKS 671, 672, 673: Drive 15	
79	PARITY	BLOCKS 121, 122, 123: Drive 19	
...	...	...	
88	GNODE	EXTENT=2	
89	DATA	BLOCKS 463, 464, 465: Drive 2	
90	DATA	BLOCKS 674, 675, 676: Drive 5	
91	PARITY	BLOCKS 124, 125, 126: Drive 13	
...			

FIGURE 27

## ARRAY PREPARATION / G-TABLE FORMATTING

2448

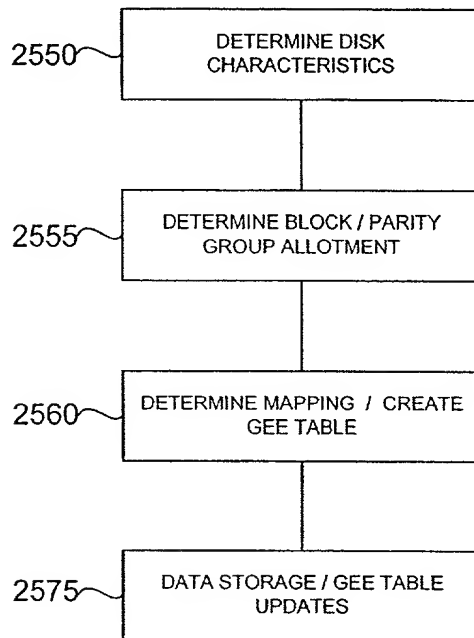


FIGURE 28

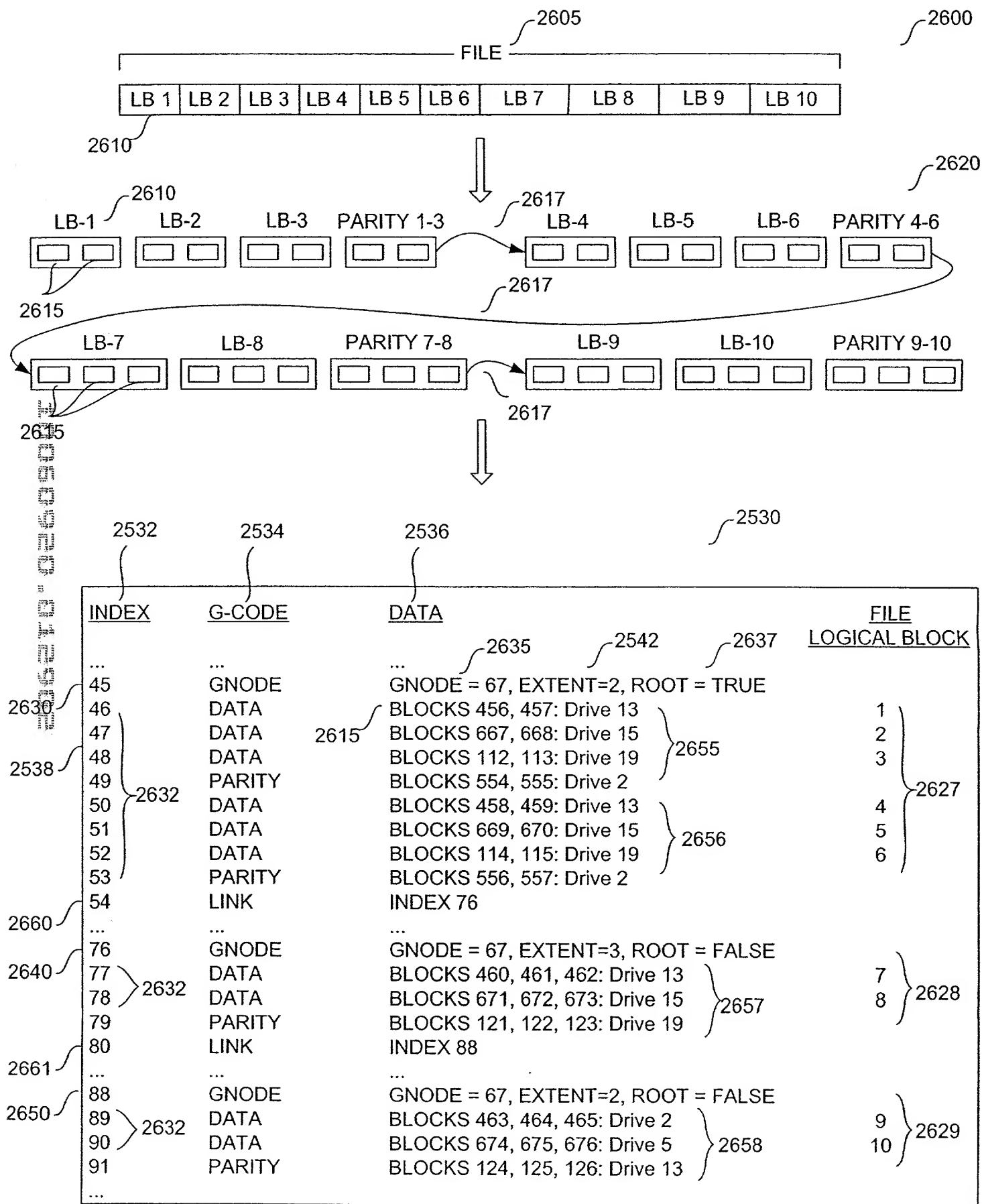


FIGURE 29

# DRIVE FAILURE RECOVERY MECHANISM

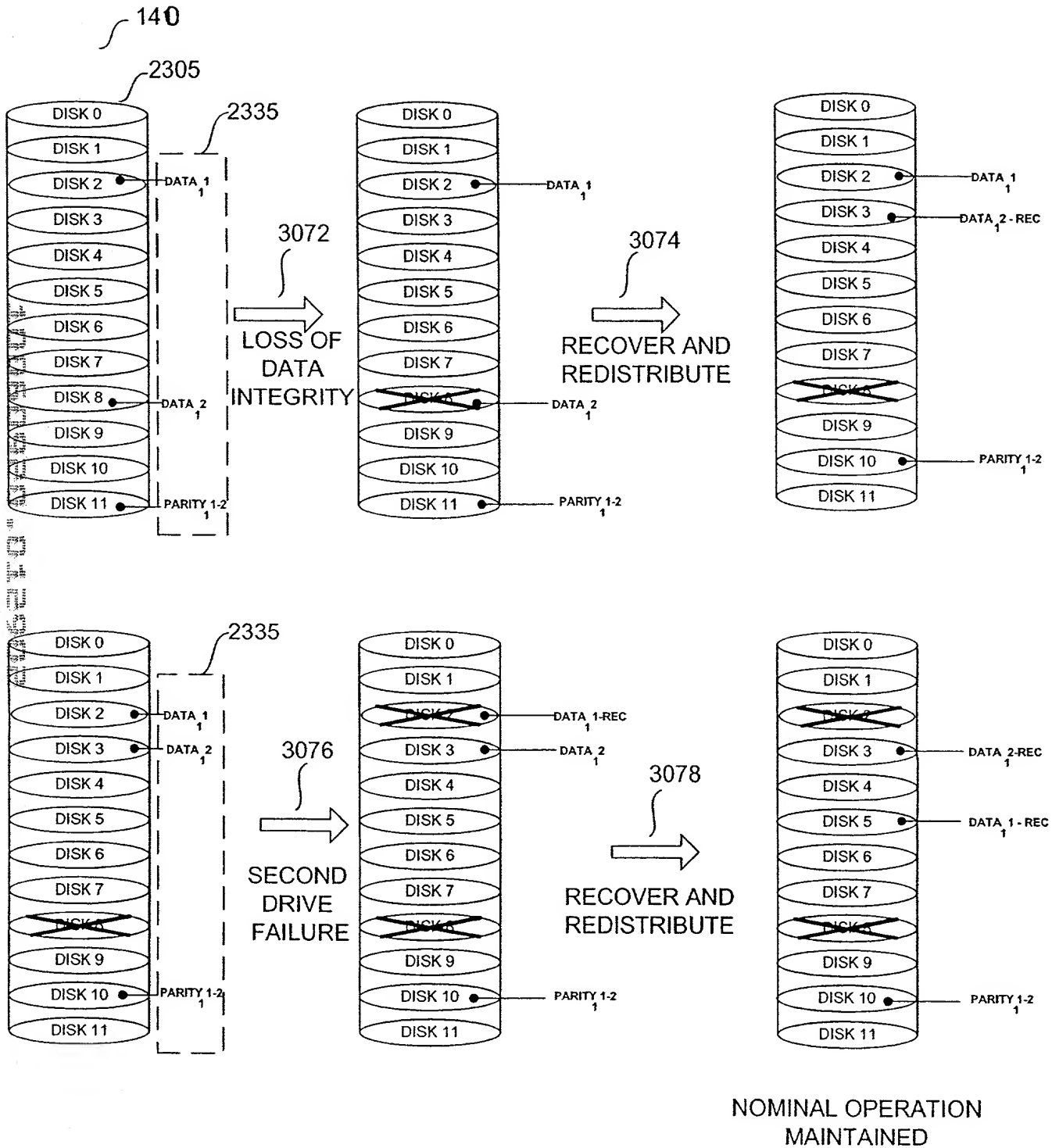


FIGURE 30



2025 RELEASE UNDER E.O. 14176

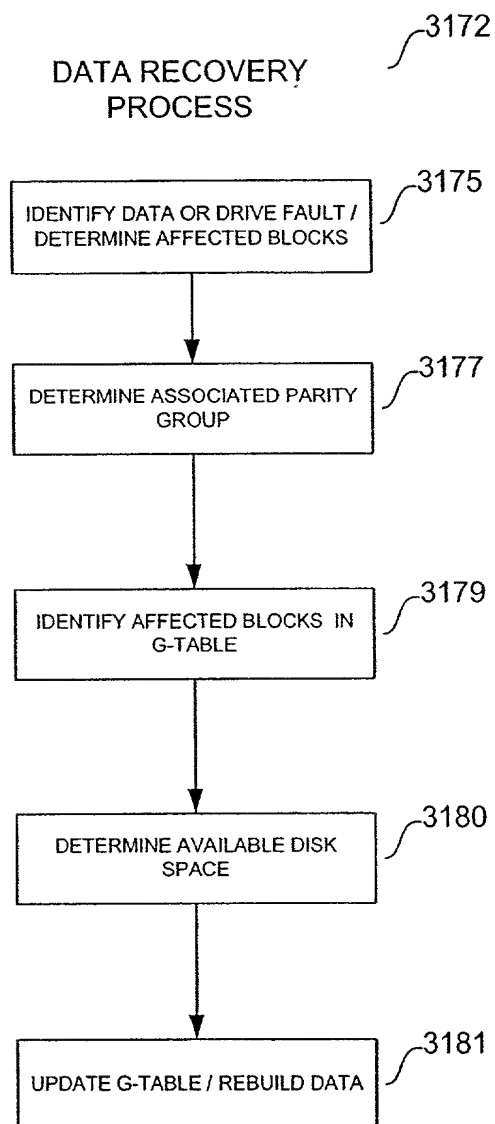


FIGURE 31

206310-02609001

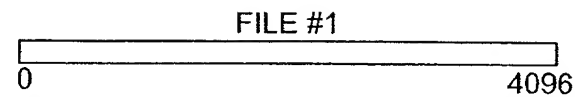
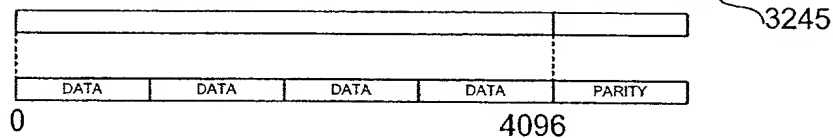


FIGURE 32A

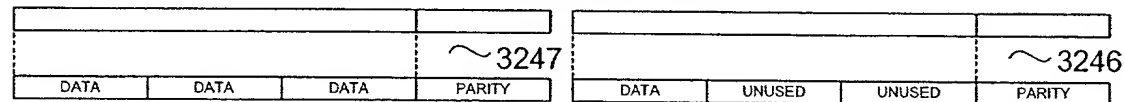
FILE #1 W/ PARITY -- 4-BLOCK PARITY GROUP -- EXTENT = 2  
5120 BYTES TOTAL / UTILIZATION = 100%

3240



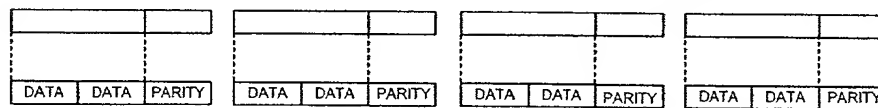
FILE #1 W/ PARITY -- 3-BLOCK PARITY GROUP -- EXTENT = 2  
8192 BYTES TOTAL / UTILIZATION = 66%

3241



FILE #1 W/ PARITY -- 2-BLOCK PARITY GROUP -- EXTENT = 1  
6144 BYTES TOTAL / UTILIZATION = 100%

3242



FILE #1 W/ PARITY -- 1-BLOCK PARITY GROUP -- EXTENT = 1  
8192 BYTES TOTAL / UTILIZATION = 100%

3243

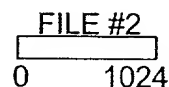
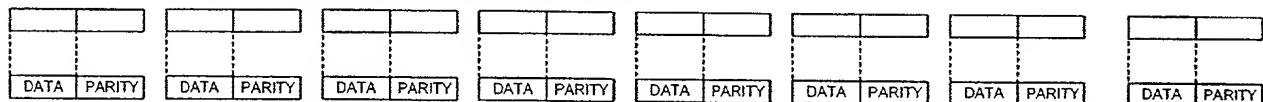
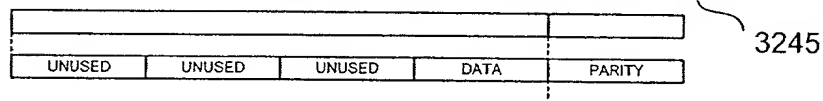


FIGURE 32B

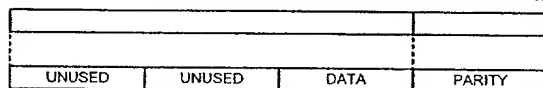
FILE #2 W/ PARITY -- 4-BLOCK PARITY GROUP -- EXTENT = 2  
5120 BYTES TOTAL / UTILIZATION = 25%

3250



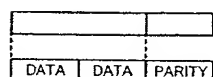
FILE #2 W/ PARITY -- 3-BLOCK PARITY GROUP -- EXTENT = 2  
4096 BYTES TOTAL / UTILIZATION = 33%

3251



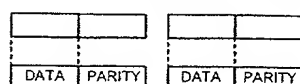
FILE #2 W/ PARITY -- 2-BLOCK PARITY GROUP -- EXTENT = 1  
1536 BYTES TOTAL / UTILIZATION = 100%

3252



FILE #2 W/ PARITY -- 1-BLOCK PARITY GROUP -- EXTENT = 1  
2048 BYTES TOTAL / UTILIZATION = 100%

3253



3360

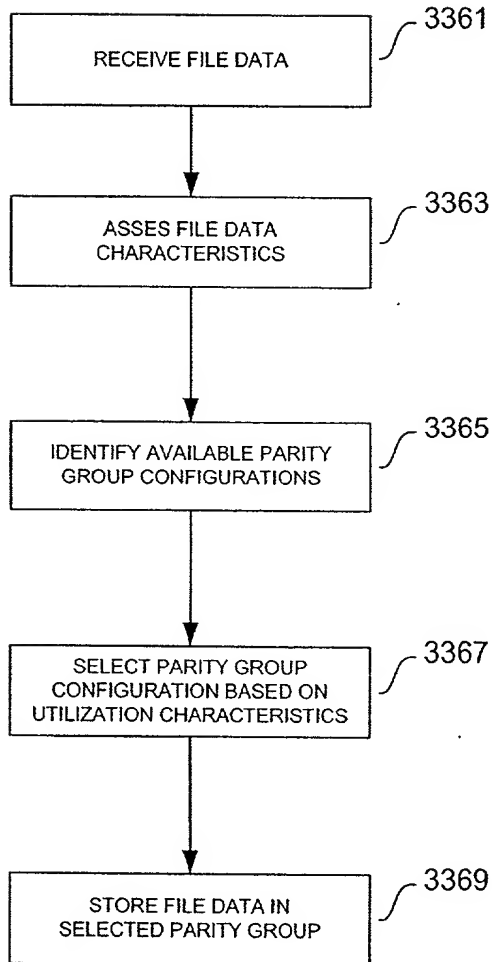


FIGURE 33

FIGURE 34A

FIGURE 34A

INITIAL ALLOCATION		DISK SPACE %						
<table><tr><td>DATA</td><td>DATA</td><td>DATA</td><td>DATA</td><td>PARITY</td></tr></table>	DATA	DATA	DATA	DATA	PARITY	4 block parity	10000 groups	36%
DATA	DATA	DATA	DATA	PARITY				
<table><tr><td>DATA</td><td>DATA</td><td>DATA</td><td>PARITY</td></tr></table>	DATA	DATA	DATA	PARITY	3 block parity	10000 groups	28%	
DATA	DATA	DATA	PARITY					
<table><tr><td>DATA</td><td>DATA</td><td>PARITY</td></tr></table>	DATA	DATA	PARITY	2 block parity	10000 groups	22%		
DATA	DATA	PARITY						
<table><tr><td>DATA</td><td>PARITY</td></tr></table>	DATA	PARITY	1 block parity	10000 groups	14%			
DATA	PARITY							

FIGURE 34B

DISK USAGE				DISK SPACE %
FREE	OCCUPIED	TOTAL		
2500 groups	7500 groups	10000 groups		36%
7500 groups	2500 groups	10000 groups		28%
3500 groups	6500 groups	10000 groups		22%
500 groups	9500 groups	10000 groups		14%

FIGURE 34C

REDISTRIBUTION				DISK SPACE %
FREE	OCCUPIED	TOTAL		
2500 groups	7500 groups	10000 groups		36%
2500 groups	2500 groups	5000 groups		14%
3500 groups	6500 groups	10000 groups		22%
10500 groups	9500 groups	20000 groups		28%

-5000 groups of 3 block parity  
 +10000 groups of 1 block parity

REDISTRIBUTION

# PARITY GROUP REDISTRIBUTION PROCESSES

3510

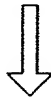
FIGURE 35A

## PARITY GROUP DISSOLUTION

### 5-BLOCK PARITY GROUP

3515

DATA	DATA	DATA	DATA	DATA	PARITY
------	------	------	------	------	--------



### 1-BLOCK PARITY GROUP

3520

DATA	PARITY
------	--------

### 3-BLOCK PARITY GROUP

3525

DATA	DATA	DATA	PARITY
------	------	------	--------

OR

### 2-BLOCK PARITY GROUP

3530

DATA	DATA	PARITY
------	------	--------

### 2-BLOCK PARITY GROUP

3530

DATA	DATA	PARITY
------	------	--------

OR

### 1-BLOCK PARITY GROUP

3520

DATA	PARITY
------	--------

### 1-BLOCK PARITY GROUP

3520

DATA	PARITY
------	--------

### 1-BLOCK PARITY GROUP

3520

DATA	PARITY
------	--------

FIGURE 35B

## PARITY GROUP CONSOLIDATION

3535

### 2-BLOCK PARITY GROUPS

3530

DATA	DATA	PARITY
------	------	--------

DATA	DATA	PARITY
------	------	--------



### 3-BLOCK PARITY GROUP

3525

DATA	DATA	DATA	PARITY
------	------	------	--------

### 1-BLOCK PARITY GROUP

3520

DATA	PARITY
------	--------

OR

### 5-BLOCK PARITY GROUP

3515

DATA	DATA	DATA	DATA	DATA	PARITY
------	------	------	------	------	--------

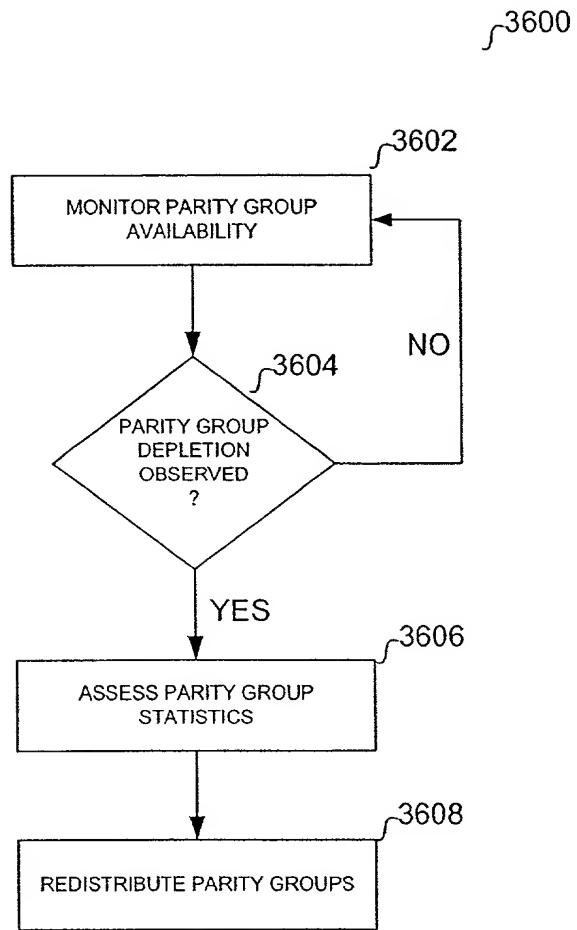


FIGURE 36

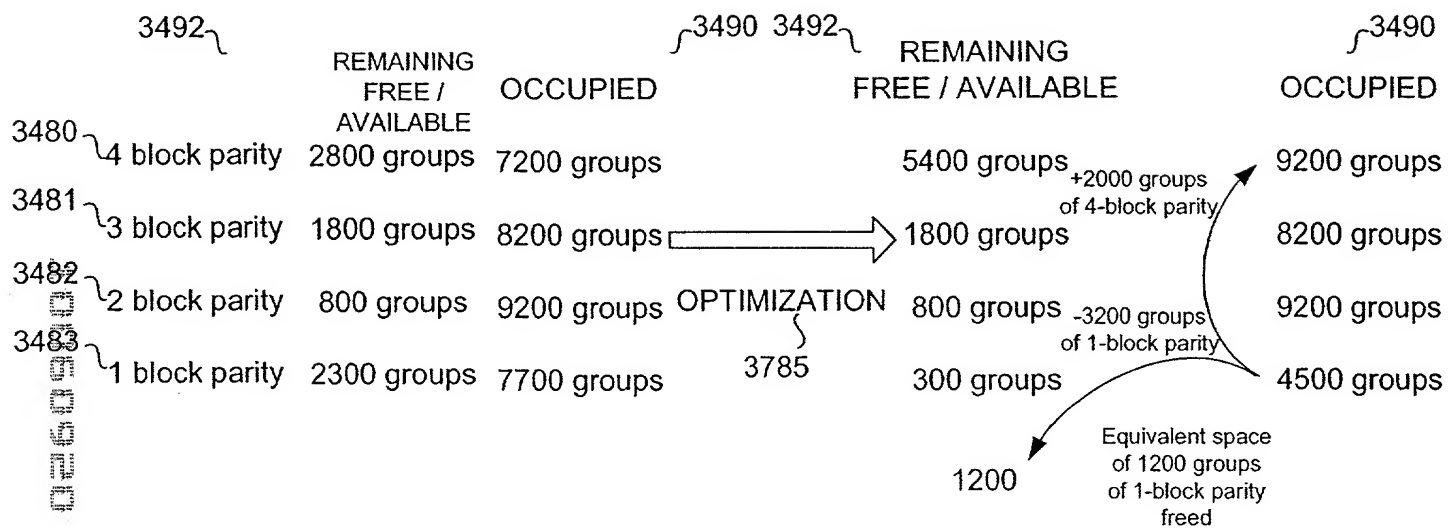


FIGURE 37

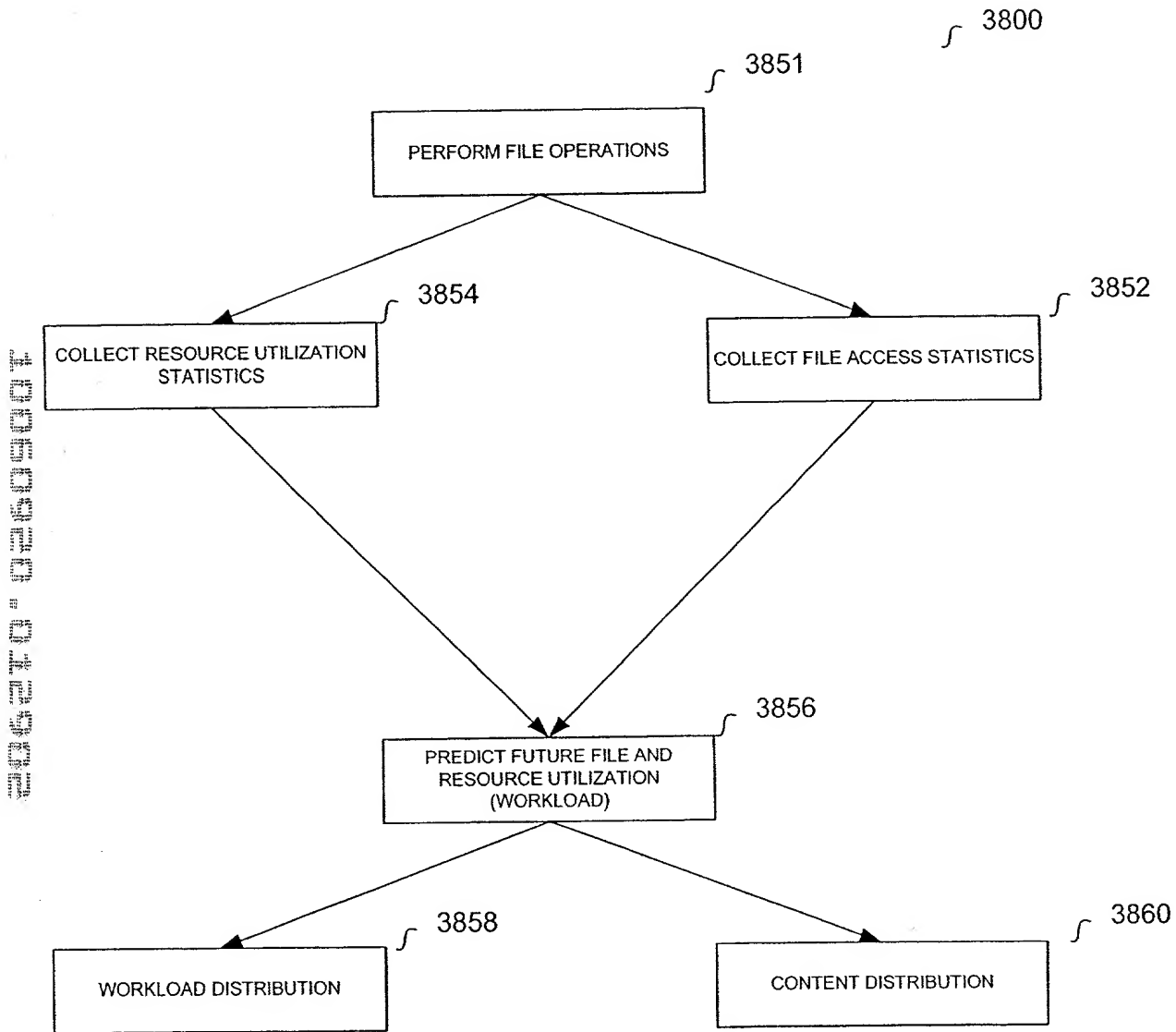


FIGURE 38



3900

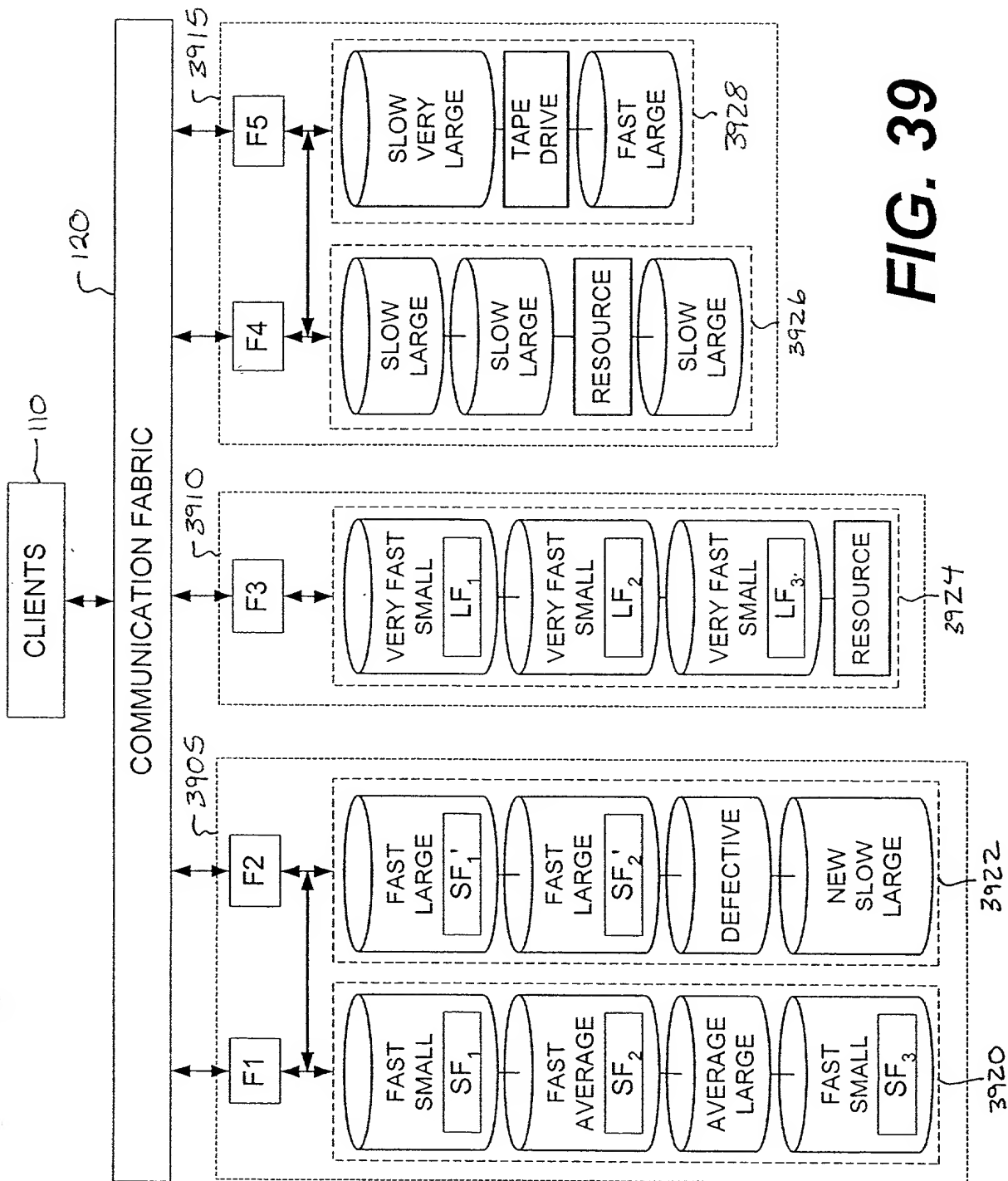
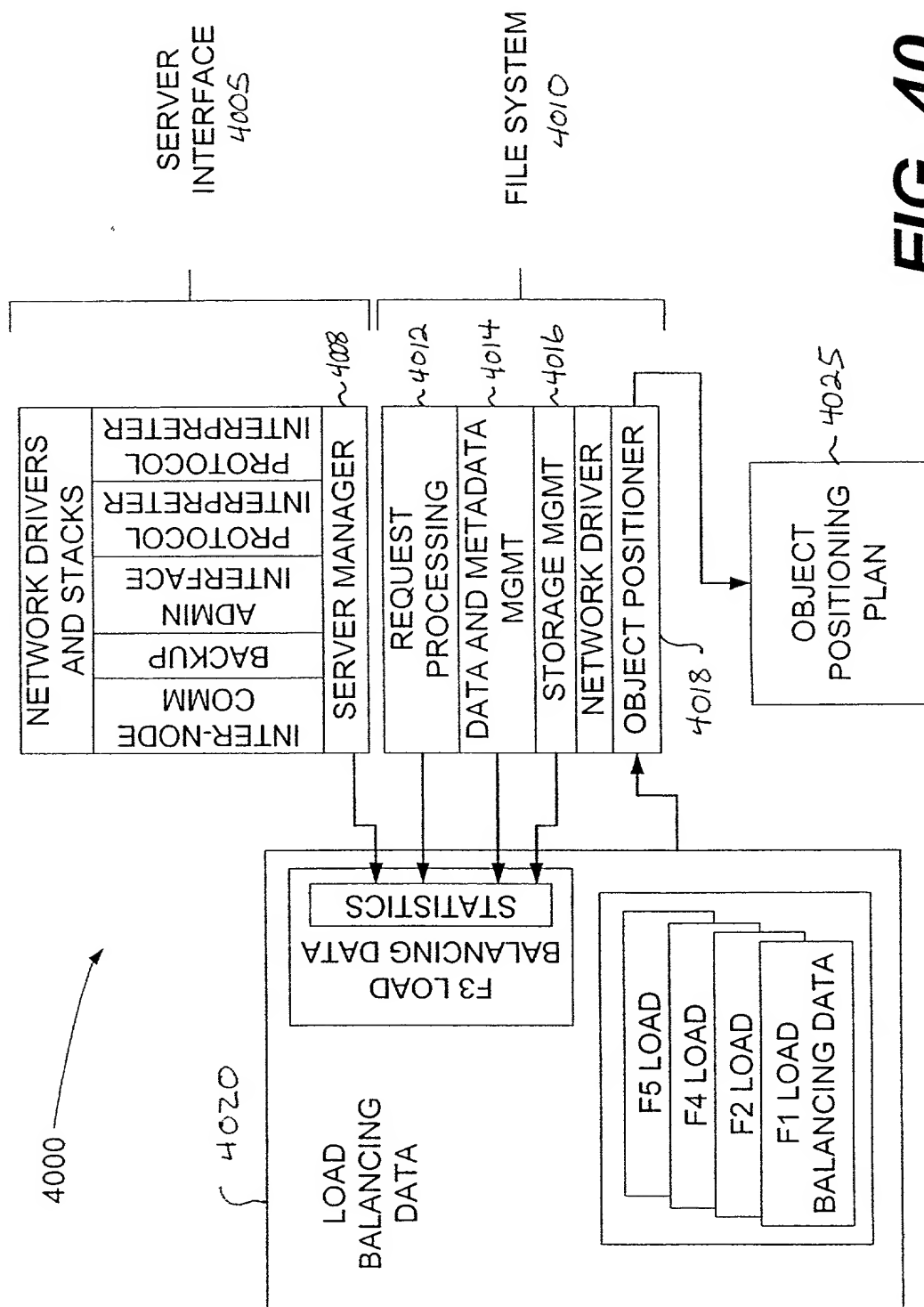


FIG. 39



**FIG. 40**



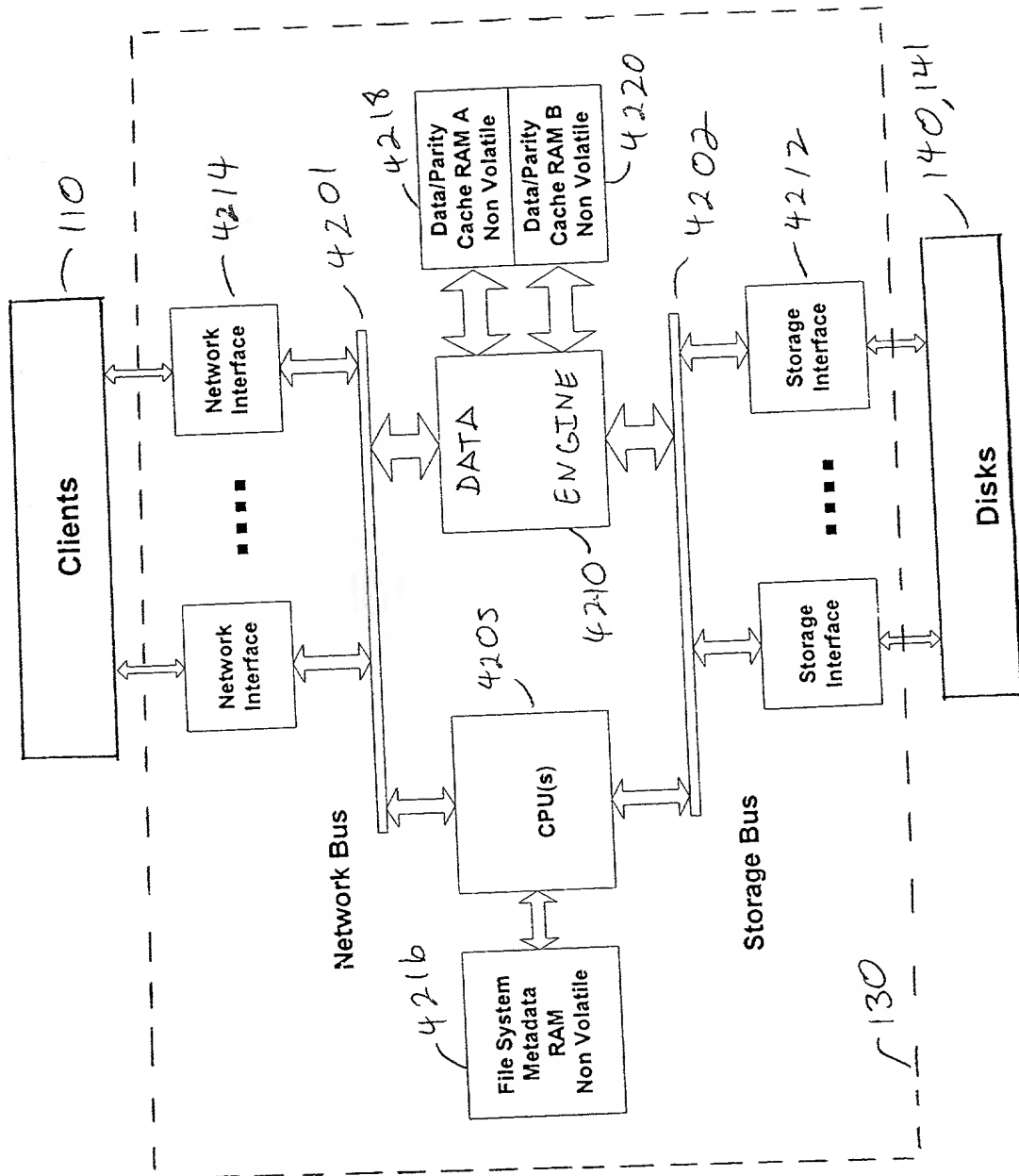


FIGURE 42

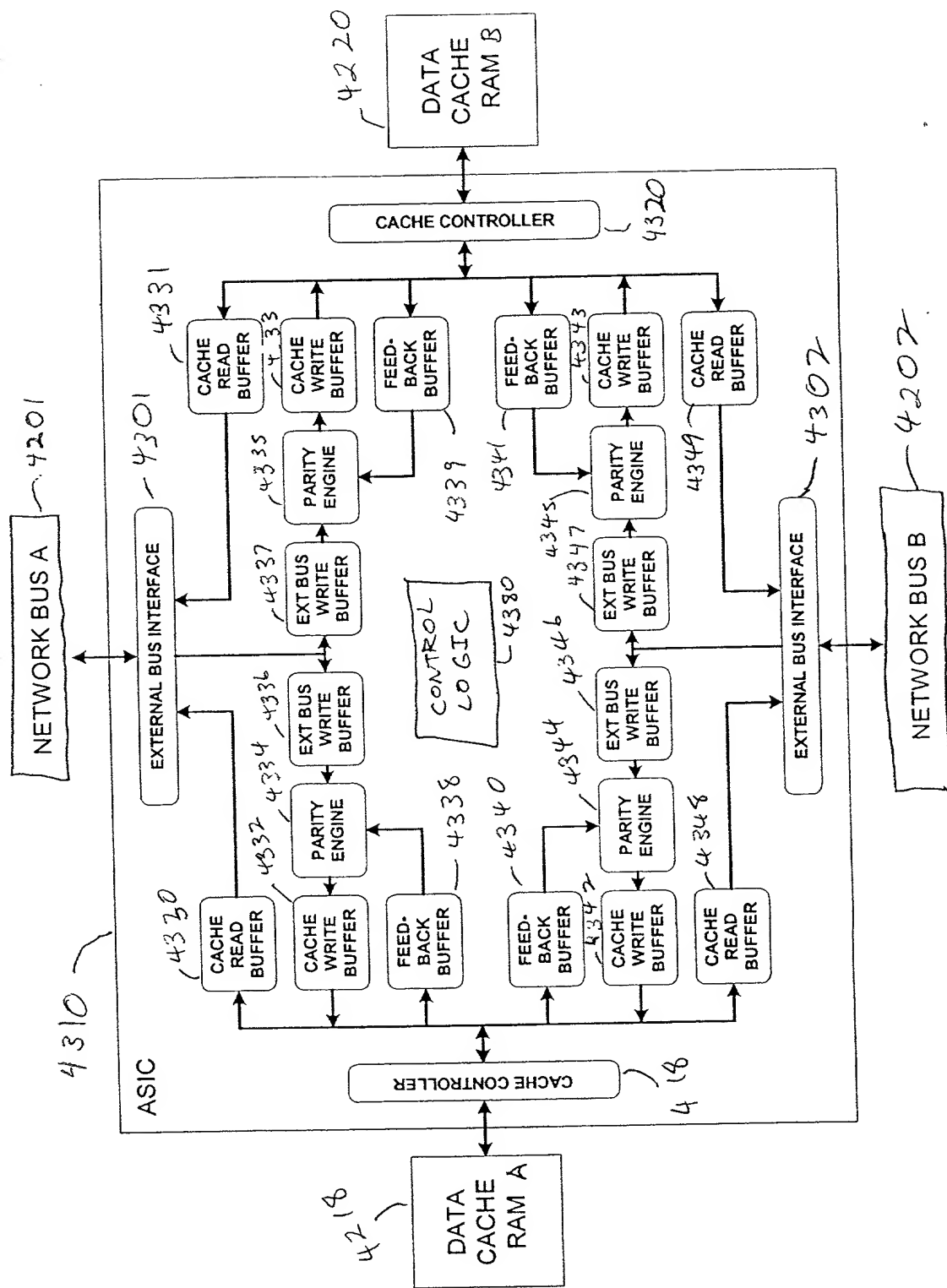


FIGURE 43

PCI map	Block Size	Opcode	Spare	Parity Index	Spare	RAM Addr
63-----62, 61-----59, 58-----56, 55-----51, 50-----35, 34, 32, 31-----						0

↑  
4400  
FIGURE 44